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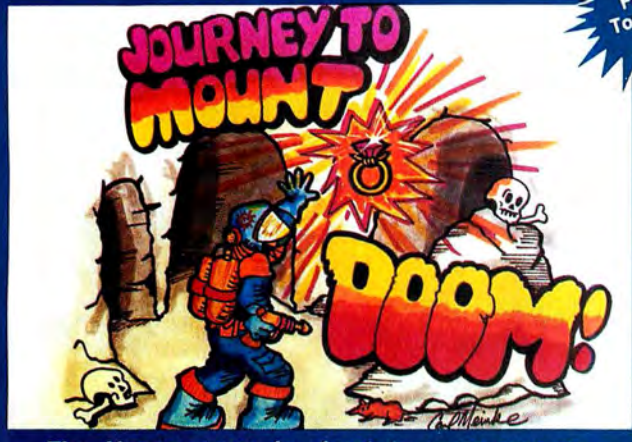
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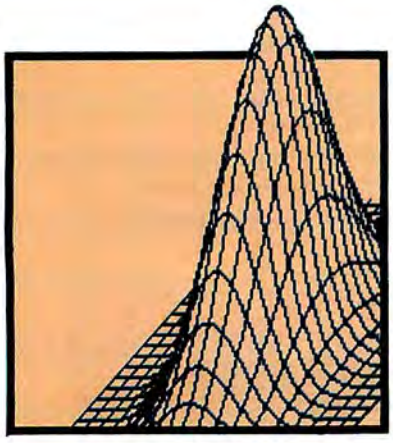
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NEXT MONTH: A special on data communications and the judges' decisions on our Simulation Contest! Want a BBS of your own? Our November issue features a program listing for a bulletin board system that requires only one disk drive as well as a method to "wash" your disks. Harry Hardy will examine synchronous data transmission and we'll learn all about data transmission with the CoCo.

In addition to printing our top Simulation winners' programs, we'll have more games, more home use programs, more educational material and more information on our Color Computer than is available anywhere else.

Look for November's *Rainbow*!

The Rainbow

October 1983 Vol III No. 3

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letters to RAINBOW

DISK EXECUTIONER

Editor:

Floppy disks are very sensitive little critters. Cigarette ashes, cat hairs and dust can zap them really quick. To avoid disk errors and get as much use as possible from each disk you have to treat them like sacred religious objects.

As soon as I get a failure to write to any sector on a disk I transfer all the contents to a backup disk (if I don't already have a backup) and put the culprit disk in my shooting bag.

On my weekly pilgrimage to the firing range with my trusty .45-caliber automatic pistol, the disks first get stapled to the target backdrop and then while taking aim, I recall that blank feeling when I got my first disk I/O error and lost a valuable program, then squeeze the trigger. A fellow shooter who lost his job to a computer finds it very therapeutic to put what is left of the disk out of its misery with a double-barreled shotgun.

Dirty Harry never had it so good.

J. Michael Nowicki
San Jose, CA

EPSON NOTE EXCHANGE

Editor:

I would like to compliment you on your excellent magazine, and encourage you to keep up the great work. I look forward to receiving *the Rainbow* each month, I read it from cover to cover and refer to it often while "computing." I have had my CoCo for over a year and have expanded it to 32K. I plan on purchasing a disk system soon, and already own an Epson MX-80. If anyone has a similar system, and would like to exchange notes, please write me at 8521-26 Hower Rd., 54548.

Mark Leman
Minocqua, WI

INFORMATION, PLEASE

Editor:

Radio Shack and CompuServe have referred me to you with my hardware/software problem.

I have all Radio Shack equipment—TRS-80 Color Computer 16K with one I/O 4-pin port—Vidtex CompuServe/Dow Jones Program Pack.

My problem is I want to print simultaneously screen and printer while on line with CompuServe as most customers do. I've been told the Radio Shack Program Pak does not have commands for printer. Also, I'm not sure if the Modem I cassette outlet will run the printer as well as cassette or if an adapter to get two I/O outlets in computer is required.

Can you offer any suggestions, or poll readers or refer me further? Please respond to: RR 1, Box 150A Westview, 11952.

Walter R. Silleck
Mattituck, NY 11952

Editor:

I would like to extend my thanks to two previous software/hardware authors (even programmers and hackers need positive reinforcement):

Mr. DiStefano for his article on modifying CoCo to display reverse video. His article was comprehensive and his plans were easily followed. I comprehended, I followed, and I now have the closest thing possible to a "green screen" monitor without suffering through billfold surgery and actually buying one. Thanks, Tony.

Mr. Good for his article on printer spooling. I had to modify his program slightly (a horrifying undertaking since it was in assembly language) to get it to work on my system, a 32K CoCo, non-Disk Extended BASIC, and a LP VIII. The modification was definitely worth the effort and now, just as promised, throughput is vastly increased. I will be glad to elaborate on the modification to anyone experiencing problems if they send me a S.A.S.E. c/o 6555 Pawnee Circle, 80915. Thanks, Steve.

If any of you "machine language whizzes" have changed *Tele64* to display on a black screen (reverse video) or have gotten *Tele64* to produce a key beep (click, etc.), I would much appreciate hearing from you—I'm sure all readers would be very appreciative.

Herbert B. Ridge
Colorado Springs, CO

Editor:

I've been looking for a game where you can look out a viewport and see the landscape. What I had in mind was a plane, but a land vehicle would do all right. A couple of examples are *Red Baron* and *Battle Zone*. If you know of a game like this, please tell me: 2532 W. Mesquite.

Eric Kertesz
Chandler, AZ

Editor:

I would like to find out from other Color Computer owners if anyone can tell me how to solve this problem.

My computer starts to print garbage on the left side of the screen in two rows approximately tabs 5 and 10. Then the machine "hangs up" and must be turned off, thereby losing everthing. This happens after being on 10 to 30 minutes. However, if I turn the machine on-off-on when first used, the problem usually does not occur. This is a big hassle when keying in a long program as I must make several saves to protect the program I'm keying in.

Any help appreciated; replies to 12063 Trampe Hts., 63138.

Cornelius Washington, Jr.
St. Louis, MO

Editor:

I recently tried to link RS Digitizer to my Color Computer. I need to measure irregular surfaces for my work. Unfortunately, the machine language program supplied did not work and the demo program for CoCo had non-available commands like "DEFINT." It is no surprise that nobody is buying it and that RS plans to discontinue the product. If anybody has succeeded in linking the digitizer to CoCo, please contact me at 1708 Simard, J1J 3X1.

I enjoy your magazine very much.

Pierre Blondeau
Sherbrooke, Quebec, Canada

ANOTHER SERPENT VICTIM

Editor:

I have been trying at Radio Shack's adventure game *Pyramid* for a long time now and I still can't get by the green serpent.

I was wondering if any of you adventurers out there could help me. Any clues at all would be helpful. Send to RD2 Box 331, 26035.

John Jenkins
Colliers, WV

LOOKING FOR FELLOW MC-10ERS

Editor:

I am writing in the hopes of finding other readers who are interested in the new Radio Shack MC-10 MicroColor Computer. I have just purchased this new machine, and would like to start a users' group.

Any interested readers (both owners and potential owners) who send me a S.A.S.E. will receive the group's first newsletter and a member survey, inviting them to join the group. Due to time and expense constraints, only inquiries accompanied by the S.A.S.E. will be acknowledged.

Bob Kantor
Ossining, NY

PRECAUTIONARY NOTE

In reference to Ben H. Little's letter in last month's *Rainbow*, recommending using the TV chassis as a ground point, we caution you about a potential shock hazard present in "hot chassis" TV sets. We do not recommend grounding to TV chassis as, under abnormal conditions, dangerous voltages could possibly be present.

PLEASE, I'D RATHER DO IT MYSELF

Editor:

I am the owner of a 16K Extended BASIC CoCo. I would like to upgrade it to 64K. Would it be better for me to have Radio Shack do the upgrade for $170 or do it myself for $50? People have told me that if you do it yourself the addressing will be different—is this true? Also, for the readers with *Colorpede* you can speed up the game by *POKEing 7690,88* and slow it down by *POKEing 7689,0*. Keep up the good work on a great magazine.

Scott Drake
Pine City, NY

EDITOR'S NOTE: There will be no problems doing it yourself if you follow the instructions in *Rainbow*.

EDUCATIONAL RESPONSE PLEASE

Editor:

I have been very impressed with the issues of your magazine which I have recently purchased. You are to be congratulated on producing a forum which can only help in the development of support for the Color Computer.

I am wondering if some of your readers can help me. This fall I will be supervising a pilot program which will introduce computers to children in several schools in our local school district (Knox County, Tennessee). We will be using the Color Computer. I would like to hear from educators who have or are using computers in schools, particularly elementary schools. I am interested in their experiences with the machine, with children's reactions, with various software. I would be happy to share the results of our pilot with any interested readers as it progresses. My address is Johnson Bible School, Kimberlin Heights Station, 37920.

Chris Templar
Knoxville, TN

PRINTER OUTPUT BLUES

Editor:

Haven't been able to interface my Model 33 teletype with *Telewriter*.

Your listing #2 and loop supply work perfectly after making corrections suggested in June *Rainbow*.

Am trying to vary driver/program so can use on *Telewriter*. *Telewriter* has (14) JSR $AZBFs which I have changed to JSR 32719s.

If I change line 290 in listing #2 to JSR $AZBF and try to *RUN*, very strange things happen! Could you help me?

Secondly, I find no $A282 or $A2Bf at all in *Sigmon* and *Super Color Writer*. Any suggestions on where to start on these?

Craig Anderson
Eldridge IA

EDITOR'S NOTE: See next letter.

Editor:

Thank you for your hardware interface in the February issue of *the Rainbow Magazine*. I have put it together and it works great; in fact I'm using the ASR-35 to print this computer-generated letter.

There is a problem, though, and I was wondering if you have come up with a solution to it. When I'm using a ROM pack such as *Spectaculator* or some other ROM pack with a *PRINT* routine in it, your program does not work. The ROM pack must take over the locations you have used to *POKE* your program in. Is there a modification to the program to allow the use of the printer with the ROM packs?

Any ideas you have will be well received, I can assure you. And again, thanks for a great interface and program. It's very valuable to me even with the problem of the ROM packs.

Grant H. Smith
Northville, NY

EDITOR'S NOTE: Some programs use their own character output routines or maybe $A2BF directly. For these programs all references to printer output such as JSR $A2BF must be changed to the address of your driver routine. At the same time your driver routine must end with a $39 or RTS instructions.

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COCO DIALER

Editor:

I've enjoyed your magazine ever since I first ordered. I've also learned a lot through it.

I'm working on a phone dialer, through the CoCo, by making internal clicks — through motor on:motor off commands. Are there any *POKEs* or any commands (ML) that will make a click in the computer quickly in a row?

My friend made a program for his computer (Model I TRS-80) that dialed the phone quickly. I have a 64K ECB computer and am using a dial phone.

Damon Frazier
Binghurst, IN

EDITOR'S NOTE: *POKE &HFF21, &H3C* to turn on cassette relay, *POKE &HFF21,&H34* to turn it off. We do not recommend using the cassette relay to dial telephones due to the voltages that are present.

KUDOS

Editor:

I have been receiving *the Rainbow* for just over half a year now, and I cannot believe the growth I have seen in your publication. The most amazing part of that growth is the fact that the quality of *the Rainbow* has been maintained, while the magazine itself has grown by 50 percent.

This is the second time that I have written to you. The first time I complained about *Telewriter 64*, and the time it was taking for me to receive it from Cognitec. As you can see, I am a very happy *Tele-64* user. Cognitec deserves credit for a great word processing program, and my thanks to you for your assistance.

In closing, let me say that the best just keeps getting better. Keep up the good work.

Ted Gundersen
Valhalla, NY

Editor:

I recently purchased a TRS-80 Color Computer (or rather my dad paid for it for me) and am very pleased with its capabilities. However, I am looking for more and better quality software from magazines. The only programs I have keyed in so far are Dragon-32 programs from British magazines. Unfortunately, none of them have been particularly good. Reading through *TRS-80 Microcomputer News* my attention was caught by a paragraph on magazines which stated that the *Rainbow* magazine covered the Color Computer and has "editorial content of high quality and will be of use to our customers."

Michael Mooney
Glasgow, Scotland

Editor:

I want to thank you for your incredible service. When my July issue of *Rainbow* didn't arrive, I went into mourning and my family, into hiding. I just couldn't believe it. I managed to hold off until the 25th as your policy states. At that time I rushed a letter off to your offices. Congratulations! Your system really works. I have received my magazine already. Such fine service should not go unnoticed. To all your staff, I thank you.

Leonard Hyre
Cambridge, MD

COCO GROWS UP

Editor:

I own a 16K Extended BASIC TDP-100, and I would like to expand the computer to 64K. What I need to know is do I have to only buy 64K RAM chips to make it into a full 64K computer? I have studied your magazine and I still haven't figured it out yet. I would also like to know why certain *POKE* statements such as 65497,0 mess up the computer and why useful *POKE* statements such as 65495,0 do certain tasks. Thank you for a fantastic magazine.

Paul Miller
West Valley, UT

All you need to upgrade to 64K from 16K is eight (8) 4164 chips. Most chip suppliers will give you the instructions for the modification. For an explanation of the *POKE* statements you mentioned, obtain a copy of *TRS-80 Color Computer Technical Reference Manual* at your local computer center.

PIGGYBACK HAVOC

Editor:

I have a TRS-80 Color Computer series "D" 32K RAM (piggyback) but it didn't work properly with the disk version of RS *Color Scripsit*.

The graphic display with upper and lower case letters didn't appear. We see only "garbage" when any letter is printed.

Tell me also what I have to do to eliminate that terrible RFI when the disk controller is plugged at the ROM port.

Nelson Lunha
Monlevade, MG, Brazil

EDITOR'S NOTE: Piggy backing RAM chips produces a "memory overlay" that plays havoc with certain software. We do not have an immediate solution to your problem. To reduce your RFI, return your computer to Radio Shack (after removing the piggyback chips) and they will update your computer by adding additional grounding connections between the main board and the disk controllers.

IF YOU KNOW, TELL JOHN

Editor:

I would like to know if you or anyone else could tell me how to enter the assembly language programs that are printed in *the Rainbow*. I have the *EDTASM+* from Radio Shack.

I would like to know if any conversions are necessary. If so, could you tell me where I may find the information I need? Writing assembly language is new to me and I would like any help I can get.

I would also like to know what the ASCII number just after the number line stands for. As well as how to enter the program using *EDTASM+*. Below is an example of what I mean: (this is part of the assembly listing of *Rainbow Roach* from the June 83 issue.)

```
0001 0902                ORG16310
0002 3FB6 8E0C1F         LDX #$C1F
0003 3FB9 A684     LOOP1 LDA ,X
```

I would also like to know if anyone can tell me what the symbols in the game *Space Shuttle* stand for. As well as how you land on the runway (I crashed every time I tried to land). I would also like any clues anyone can give me on how to get through the forest in the adventure game *Dragonquest*.

I think *the Rainbow* is the best magazine out for the CoCo, and I plan to renew my subscription early so I don't miss an issue. Keep up the good work.

John D. Cleveland
Lunenburg, Nova Scotia, Canada

EDITOR'S NOTE: The number you are referring to is not ASCII but the actual machine code in hexadecimal form. The first two bytes are the address and the rest are the object code (the program). By using the memory examine/exchange commands of *ZBUG* you can enter the machine (object) code at each respective address.

NEW BBS

Editor:

I wanted to inform you of a new Bulletin Board Service, Colorado Color, for the Radio Shack Color Computer. This board is always open (barring acts of God and the perversity of computers) and supports upload and download. The 24 hour BBS number is (303) 249-7866.

Congratulations on your excellent magazine—it is hard to believe your growth since my first issue (March 1981). I gladly recommend *the Rainbow* as the best magazine for the CoCo and probably the best computer publication I receive (of six). As much as I hate tearout cards in magazines, it seems I pass out most of yours to new users. Keep up the great work!

Charles G. David
Montrose, Colorado

HINTS AND TIPS

Editor:

In the course of developing software for my new product, the Kaleidophone (see August *Rainbow*, page 156) I have discovered yet another bug in Microsoft BASIC. If you have any software that involves the use of small numbers, watch out!

This is not the usual rounding error that all floating point is subject to, but a strange quirk in 1.1 BASIC. Try this:

```
PRINT 31 — 1.0E-38
```

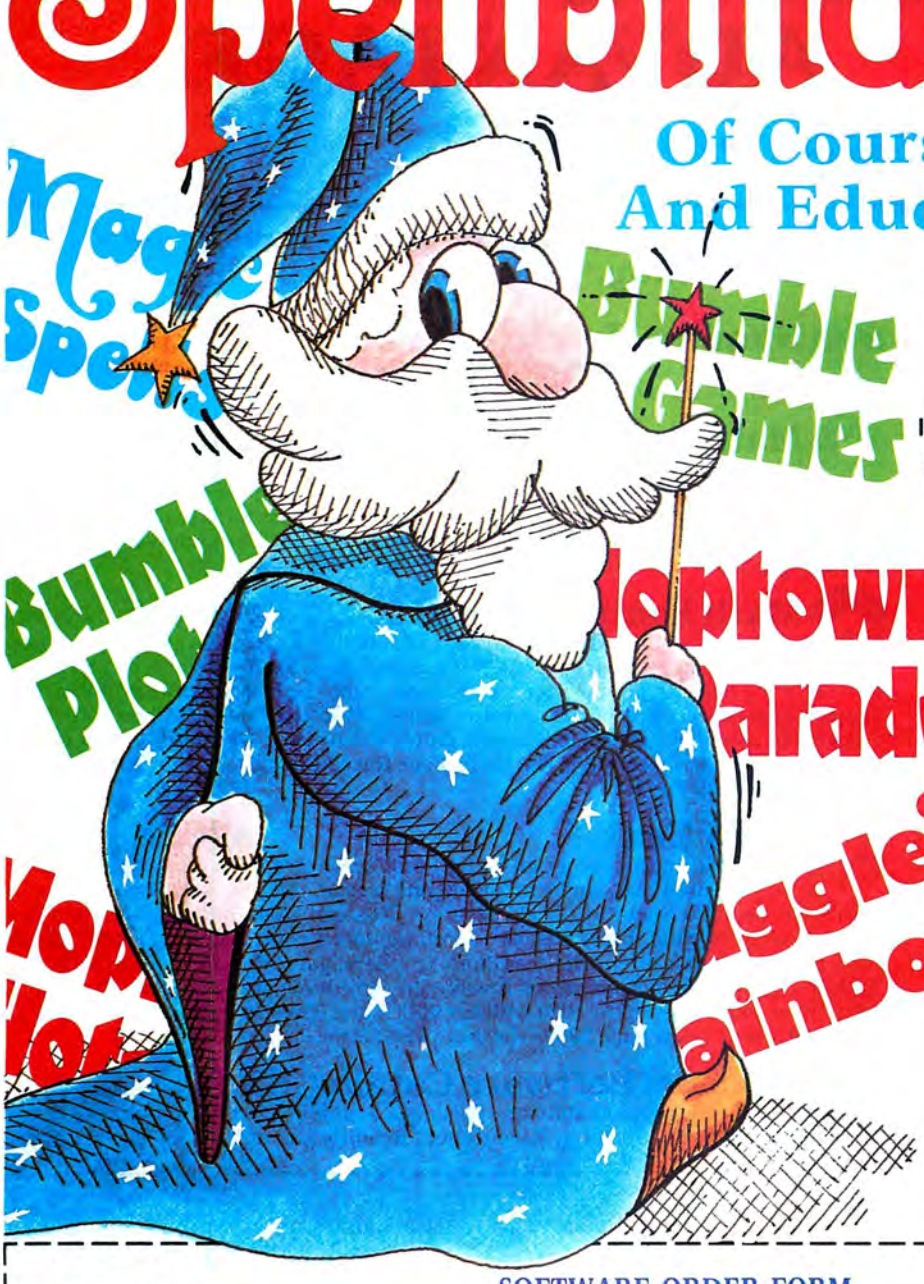
Now 10^{-38} is almost zero, so you should get 31, right? Wrong! The answer given is 1E-38!

There are many variations of this. And it's not just a problem with using E format for input. Try this:

```
10 X=1.0
```

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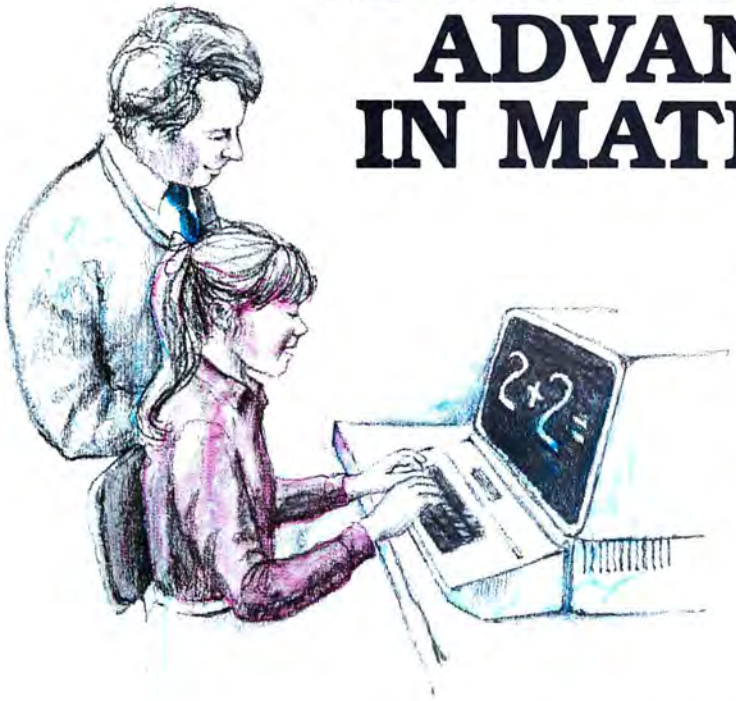
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```
20 X=X/1.1
30 IF (31-X)<30 THEN PRINT X;31-X
40 GOTO 20
```

You'll find a whole range where the error occurs—roughly $3x10^{-39}$ to $9x10^{-38}$. Note that these answers are wrong by a factor of nearly 10^{40}, not an insignificant amount to say the least!

I think all vendors of numerical software should be aware of this.

Fred K. Lenherr, Ph.D.
New Salem Research
New Salem, MA

Editor:

Are you tired of seeing the "OK" prompt forever on the screen, especially after your favorite program has just bombed? This you can change if your 80C has been converted to 64K. All that is required is to be in the all-RAM mode and key in the following:

```
POKE &HABEE, &H2B: POKE &HABEF, &H2B
```

This will change the prompt to ++. You could use any other symbol of your choice.

I initialize my computer upon start-up with this short routine.

```
10 LOADM 64K: EXEC
20 POKE &HABEE, &H2B: POKE &HABEF, &H2B
30 NEW
```

With this you can run all your favorite programs without affecting their operation.

Edgar H. Poulin
Sherbrooke, Quebec, Canada

SHARON HINTS

Editor:

In my last letter, I gave a rather complicated solution to the problem of "multiply defined symbol" error messages on Radio Shack's *EDTASM+* software.

I heard from Sharon Lunsford at Radio Shack. Here is what she had to say:

> "The 'multiply defined symbol' error message can be avoided by using the format OFFSET+LABEL instead of LABEL+OFFSET."

I tried it and it worked! If you have a line in the text file such as

```
LDX    #TABLE+50
```

change it to

```
LDX    #50+TABLE.
```

This has cleared up my problems. I hope it works for your other readers.

Dave Jenkins
Evansville, IN

Editor:

I've always liked the way *Rainbow* has treated games as seriously as other programming aspects of the Color Computer. *Rainbow's Scoreboard* is by far the most complete I've seen. Here are a few hints on two games that may help increase scores.

In case you haven't noticed, the scores for jumping barrels and knocking out pins in *Donkey King (The King)* by Tom Mix are not random. The score is derived by time left MOD 1000, so if you have 2400 time units left you will score 400 points when you jump a barrel, etc.

In *Protectors,* also by Tom Mix software, if you do a *POKE 13579,90* after you *CLOADM and before you EXEC*, the same joystick that controls your vertical movement will also control which way you shoot. This puts more control in one joystick and leaves only the "throttle" button left on the other.

Richard Uglum
Milwaukee, WI

Editor:

I like the *Pipeline* program in the June issue but I thought I'd pass along a minor modification to pick up the game speed a bit. Change line 170 to read:

```
170 FOR QX=341 TO 344:POKE QX,255:NEXT:I$=INKEY$:IF I$="" THEN 230
```

This works with 1.0 through 1.2 Color BASIC to give the arrow keys a repeat function. Addresses 338 through 345 are the keyboard "last look" buffer, and *POKEing* 255 there makes it appear that the key has been released and pressed again. Thus, the *INKEY$* function will continue to recognize the key as long as it is held down.

Stephen L. Lipps
Lebanon, IN

Editor:

First I'd like to ask some questions and then I'll give some helpful hints.

1) How do I get past the large serpent in *Pyramid*?

2) How do I get across the rug in the large rectangular room in *Raaka-tu*?

3) How do I get the green key out of the electroshock room in *Bedlam*?

Now for the good stuff!

X = 1 . . . 255

POKE 12914,X on *Donkey King (The King)* for more men.

POKE 10739,X on *Katerpillar Attack* for more men.

POKE 9009,X on *PacTac* for more men.

POKE 10489,X on *PacTac 2* for more men.

NOTE: Unlike *Donkey* and *Katerpillar*, both *PacTacs* show all men given.

If you readers have answers to questions above, write me at 19 S. Waterloo Road, 19333.

Pat J. Dolan
Devon, PA

Editor:

In response to Chris Latham's letter on page 13 of your August 1983 edition of *the Rainbow*, there is a much easier way to save high scores. Simply reset the computer after you have played for 10 minutes, type *CSAVEM*"DONKEY",12803,32512,12803. Then, whenever you load this new copy, the high scores will be included in the program itself.

You can get 300,000 points on *Donkey King (The King)* by grabbing the hammer on the first level and falling off the edge. It happens once in a while, so keep trying. Whenever this happens I don't save the high scores.

Kenny Miller
Yardley, PA

NO MODEM FOR MA BELL?

Editor:

I am looking for a way to send and receive programs using the cassette plugs over the phone lines to other CoCos. I saw an ad for a "Black Box" selling for $69 that would do this and it wasn't a modem. If I could get a schematic and a parts list I could build a few for our CoCo club members. Also maybe this circuit could be interfaced for two-meter ham radio, too. There are many CoCo owners that are hams in my area. Please contact The Radcliff Color Computer Club c/o N4GSB, 287 Highland Dr., 40160.

Bryan Harp
Radcliff, KY

EDITOR'S NOTE: Telephone transmission of data without some type of modem is possible but not recommended. For cassette output the Baud rate is close to 1500 and the bandwidth would be excessive for normal telephone transmission.

BRAZILIAN COCONUT

Editor:

I'm the leader of the only formal users' group in Brazil: The TRS-80 Color Club, P.O. Box 2951, Rio de Janeiro, with almost 100 owners and growing up very fast.

Here is one hint for your collection:

If you are getting some keyboard failures (lock out), try to switch the PIAs (6821 and/or 6822) between each other.

Francisco J.M.C. da Silva
Rio de Janeiro, Brazil

EVANSVILLE TO COCO, MOE

Editor:

I would like to form a C.C. Club in the Evansville, Indiana area. If anyone is interested, please call or write to Box 462, 47633, or phone me at (812) 874-2210.

Brian Boyles
Poseyville, IN

REVIEWER'S REPLY

Editor:

I would like to comment on the letter in the August issue from a Mr. John Plaxton regarding the software reviews published in *the Rainbow*.

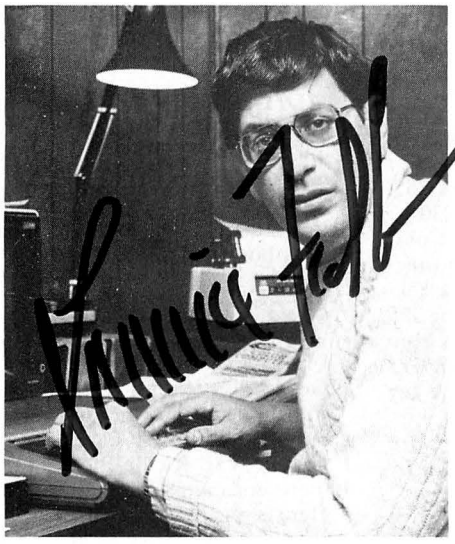
I have done several software reviews for *the Rainbow*, and can honestly say that nothing has influenced the context of my reviews other than the product itself. Mr. Plaxton correctly pointed out, however, that opinions vary, and I guess that this can be further influenced depending on what other programs the reviewer has seen.

I have never reviewed what I considered to be a bad program, but I would like to point out that there is a difference between the choice of phrases such as "so-and-so is a fun game" as opposed to "so-and-so has excellent graphics and sounds."

One final point that I'm sure most of your readers are not aware of is that except for spelling, grammatical, and punctuation changes, *the Rainbow* editorial staff does not, in any way, change the reviews from the way that they are received.

Gerry Schechter
Yonkers, NY

PRINT #-2,



The issue of software theft, sometimes called piracy, is one of the hottest ones in the computer marketplace today. One of the main reasons for this, frankly, is because of what has been happening in the past few months in the Model I/III market.

A number of companies which have been producing some fine quality software for those machines have gone out of business and the reason that we are hearing that this has happened is because of the large amount of illegal software on the market.

That fact, plus the anticipated pullout of at least one major software vendor in the CoCo field, suggests that there is a major problem brewing in this area. Yes, we have written about software theft before — but the issue appears, at least to us, to be more serious at this time than at any time in the future.

Without doubt one of the reasons is because the Color Computer has grown to be one of the major forces in the marketplace. The potential for successful sales is greater than ever before — and that potential increases every day. Finally, with the introduction of the Color Computer 2, the 64K CoCo and the OS-9 operating system by Radio Shack, the potential is so great that it staggers the imagination.

The problem, however, is that it also attracts those who would seek to get something for nothing. And, while we do not condone it, the problem is reaching the proportions that the simple "copying a program for a friend" version of software piracy, while certainly damaging, is small scale. When bulletin boards spring up which are devoted to allowing illegal copies of commercial software to be downloaded, when "pirate newsletters" appear, when "companies" sell pirated software, there's a big problem out there.

We've talked about this before, but the consequences of software theft are considerable. They mean that many talented programmers will simply stop, or never start, writing for the Color Computer. They mean that the cost of your software will go up. They mean that some companies with the resources to produce and market truly innovative programs will simply get out of — or never decide to enter — the CoCo field.

The Rainbow has been a part of the Color Computer market for more than two years now. We have talked about software theft in the past. And, we have done a few things. Now, we are doing more and I think it might be helpful if we let you know what they are.

We are asking all our advertisers to remove those "copy anything" programs from the market. Yes, we realize that some programs are sold with protected disks and tapes and that it can be a hassle to get a replacement. We are also asking our advertisers to provide a convenient and reasonable means of backing up their software for *the personal use of purchasers.* And, we suggest that you inquire whether software is sold without easy backup potential (such as Radio Shack, which gives you two disks in its *Sands of Egypt* package).

We have also asked Color Computer clubs to approve bylaws that forbid theft of commercial software. It has been gratifying that a huge number of them — from Alaska to Florida, New York to California and in Canada, too — have done so already. It is our intention to list a directory of Color Computer clubs. With more and more people coming into the CoCo Community every day, such information is important to them.

At last spring's *RAINBOWfest* in Chicago, we asked representatives of Color Computer clubs in attendance to let us know whether they would have a problem with such a rule as a condition of being listed. No one expressed any problem. And we are in the process of preparing our directory.

The bottom line here, though, is that software theft hurts you most of all. It drives up the price of software; it limits the programs that may be available to you. And, if you do have an illegal copy of a piece of software, it will probably mean you can't get any help from the manufacturer should something go wrong.

I hope you will help us eliminate software theft. The Color Computer market is one of the most robust and successful among all personal computers. Please help us protect it so that it will continue to grow and thrive.

While on the subject of Color Computer clubs, we will soon begin a section in *the Rainbow* that will give news of CoCo Club happenings. The purpose of this is to encourage the exchange of information —interesting presentations, new ideas, projects and the like. We encourage your club to be a part of that and to expect to receive some forms soon that will help you report news to us.

Our first *RAINBOWfest* is moving along and we hope that we see many of you in Fort Worth. This show

(continued on page 284)

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Telewriter's chain printing feature means that the size of your text is never limited by the amount of memory you have, and Telewriter's advanced cassette handler gives you a powerful word processor without the major additional cost of a disk.

...one of the best programs for the Color Computer I have seen...
— Color Computer News, Jan. 1982

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64 COLUMNS (AND 85!)

Besides the original 51 column screen, Telewriter-64 now gives you 2 additional high-density displays: 64 × 24 and 85 × 24!! Both high density modes provide all the standard Telewriter editing capabilities, and you can switch instantly to any of the 3 formats with a single control key command.

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One outstanding advantage of the full-width screen display is that you can now set the screen width to match the width of your printed page, so that "what you see is what you get." This makes exact alignment of columns possible and it makes hyphenation simple.

Since short lines are the reason for the large spaces often found in standard right justified text, and since hyphenation is the most effective way to eliminate short lines, Telewriter-64 can now promise you some of the best looking right justification you can get on the Color Computer.

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Insert or delete text anywhere on the screen without changing "modes." This fast "free-form" editor provides maximum ease of use. Everything you do appears immediately on the screen in front of you. Commands require only a single key or a single key plus CLEAR.

...truly a state of the art word processor... outstanding in every respect.
— The RAINBOW, Jan. 1982

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PRESENTS



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BUILDING OCTOBER'S RAINBOW

Our graphics issue . . .
Bound for Fort Worth edition . . .
Judging the Simulation Contest . . .

In addition to the proverbial baling wire that holds many magazine operations together, *the Rainbow's* production process depends heavily on The Clipboard — if it's not on The Clipboard, don't bet on it ever hitting the printed page. About this time every month, it seems we all need The Clipboard at the same time. Lay it down and it's gone. Fortunately, it always reappears, because, without it, we would be in big trouble. It contains the evolving record of "what goes" and where it goes — and we don't even have a backup copy.

This month is our graphics special and "what goes" (which is to say what stays on The Clipboard) is influenced by how closely the article or program relates to our graphics theme. While many submissions had to be held over for later issues, one that has a solid position on The Clipboard is *Marathon*, John Fraysse's action-packed graphics game. It's fun to play — and not as hard as his *Rainbow Roach* — and, best of all, he shares with us the tricks of the trade and his special techniques for getting the most out of CoCo's graphics capability. John's article is a marathon, itself, so if you "hit the wall," take a breather and come back to it. And, if you get blisters on your typing fingers, try *Rainbow on Tape*, but don't miss *Marathon*.

One of our most colorful graphics offerings is *Flags*, which draws the flags of dozens of nations. *Color Blackjack* is a guaranteed winner, too, and even the program quickie, *Sinelines*, is a sure crowd pleaser. *Sinelines* was artist Fred Crawford's inspiration for our cover this month.

Do a *PCLEAR 40,* or so, for all the other graphics pages and, for dessert, try *Picture Your Face*, one of my personal favorites. I guess Dick Tracy has a sphere of influence that reaches all the way to Australia; at least, the Delbourgo family's latest offering reminds me of the way Junior, the police artist in the famous cartoon strip, would listen to eyewitness descriptions and then make a composite drawing of a face from an assortment of stock noses, ears, beady eyes and criminal type hairdos. I always wanted to try that; now we can all amaze our friends by letting CoCo *Picture Your Face.*

A welcome return to our pages this month is Jorge Mir, who has two articles! In addition to a cassette merge program, Jorge has *64KBASIC* for our growing number of readers with 64K.

After completing his comprehensive CoCo memory map in last month's issue, Bob Russell will return next month with additional discoveries, corrections and documentation for the new ROMs. Stay tuned for this and a special article of hints and tips on how to make the most of the memory map.

For those with I/O error blues, Harry Hardy's *Hide That Disk Directory* shows us how to initialize a 36th track! And, how to harbor an extra disk directory in out-of-the-way safety.

A final note. Even though we all have one eye on Fort Worth and our next *RAINBOWfest*, our judges are poring over the dozens of Simulation Contest entries and promise to name the winners next month in our Simulation Contest/Data Communications issue. The competition promises to be tough, though, for the quality and quantity of entries is high. Keep your fingers crossed and, in the meantime, if you haven't already done so, put a note on your own clipboard to subscribe to *the Rainbow*; with the cover price now at $3.95, a $22 per year subscription means an annual savings of more than $25.

See you in Fort Worth!

—Jim Reed

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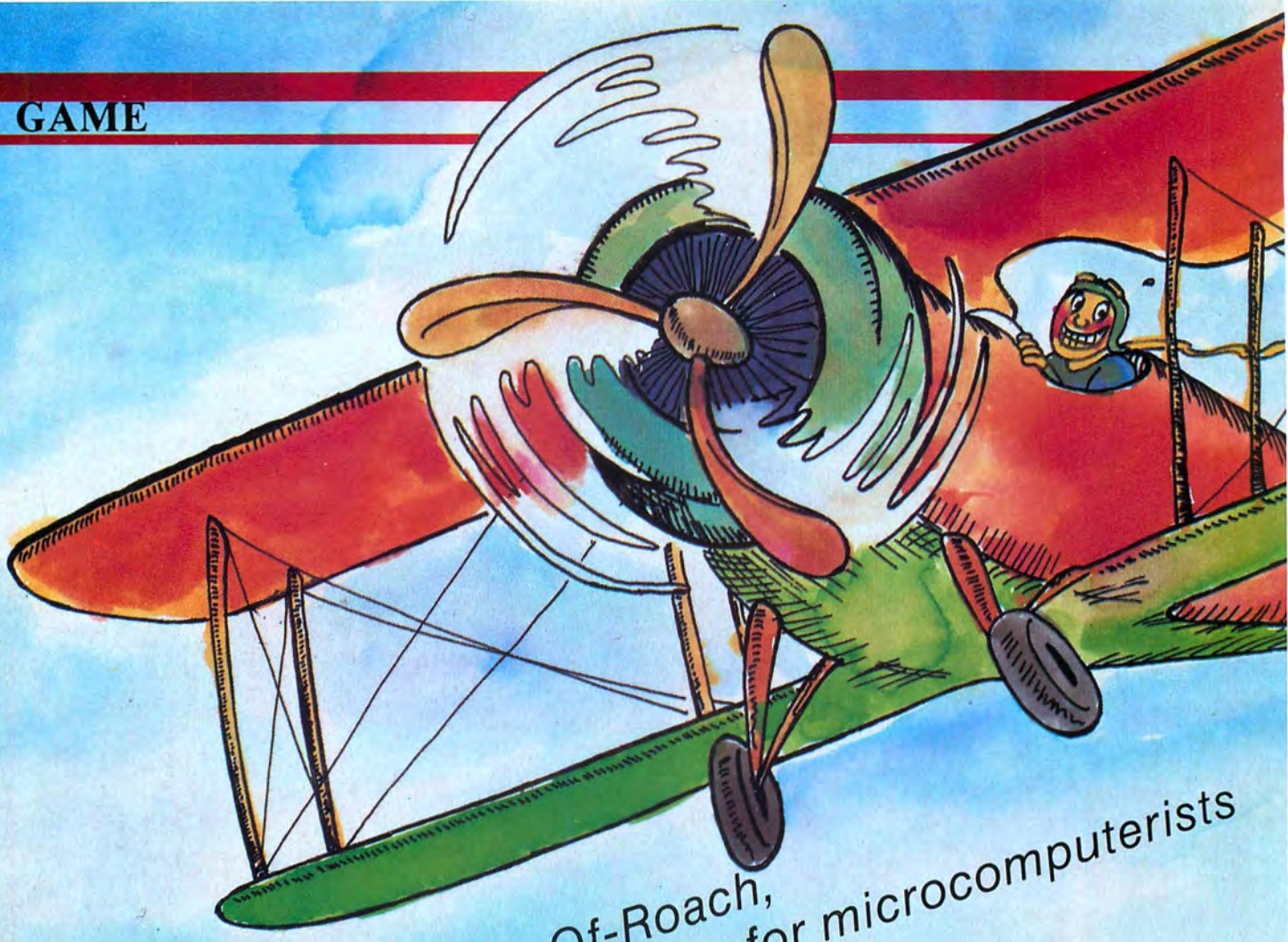
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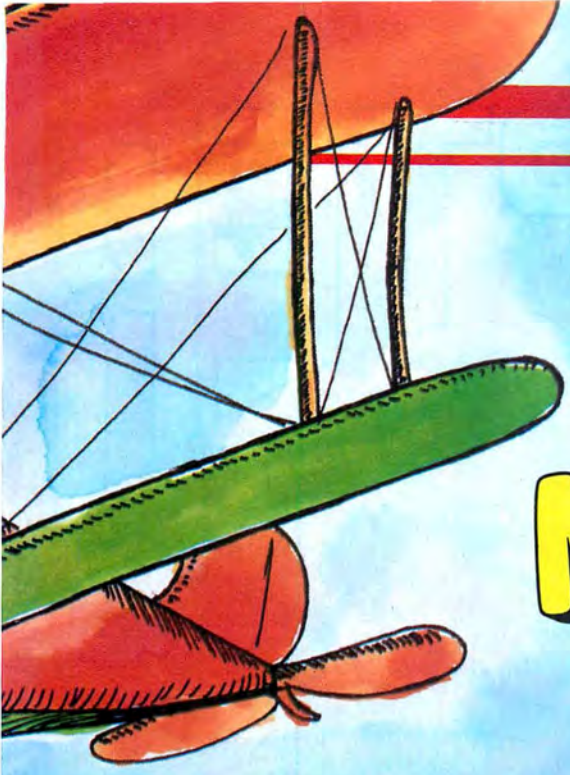


More than just a Son-Of-Roach, this multifaceted tribulation for microcomputerists

Well folks, here we go again! I must say that I was overwhelmed by the response to *Rainbow Roach* in the June 1983 *Rainbow*. First, let me say "thank you" to the CoCo community and my yet unseen friends or should I say *fiends* at *the Rainbow*. You made *Rainbow Roach* a smashing success! Now the question is are you ready for *Marathon*, which is probably what you will feel like you have been through after typing it in! But take heart, good things seldom come in small code space.

I know what most of you are thinking. *Marathon* is a *Son-Of-Roach*. Well, yes, and no. Remember, in the *Rainbow Roach* article I said that we would do some wild and wonderful things with scrolling graphics at a later date? I had *Marathon* in mind at the time as a demonstration of the applications of ML subroutines. *Marathon* has five ML subroutines, but please trust me, you will *not* need an editor or assembler—just the ECB listing provided and, of course, this article. Some of you wrote me righteously indignant that I had put a ML subroutine into a BASIC game and therefore had precluded all non-ML programmers from using the program. This was luckily *not* the case, as I explained, and will go over once again in this article. At any rate, the ML routines occupy approximately 300 bytes of memory and are written in position independent code (PIC) or "run anywhere code."

(John Fraysse, Jr. holds a degree in aerospace engineering from Virginia Tech. He and his wife Jean and their four children (ages 18 months to 12 yrs.) live in King George County, VA. Afabear Software is John's small spare-time business.)



MARATHON MADNESS!

By John Fraysse

is absolute . . .

Marathon is more complex than *Roach* . . more of an ordeal. You must first race downhill on a SLED past deviously arranged scenery, then FLY your airplane over miles of moving mountainous terrain cluttered with air traffic control problems. Next, you take to the streets at rush hour (of course), and no traffic 'copter is going to help you out. Finally, a trip into the bowels of the earth as you power your SUB through the narrow, mined crevices of the deep, and past the resting place of JAWS!

I have structured the program into two modules, or portions, of stand-alone code. With some very simple modifications, the entire *Marathon* listing (requiring 32K ECB) can be broken into two 16K ECB programs. Consequently, those of you with 16K ECB can still play *Marathon* by creating these two programs from the full listing and by *CLOADing* and *RUNning* one program over the other. Virtual memory techniques!

For 32K ECB folks, the full *Marathon* listing automatically reconfigures itself for either a disk or cassette system. It *does not* use or need a BREAK key disable or the *POKE 65495,0* CPU speedup since these things seemed to do more harm than good (judging from some of the confusion over *Rainbow Roach*). If your machine can hack it—*POKE* it and watch it fly. This is left as your choice.

As with *Rainbow Roach*, I have provided a couple of screen dumps, a program functional line description, a variable list, and an assembly listing as well as a good deal of commentary including some debugging helps. So if all these words have hyped you up, get your typing fingers and your "bug spray" ready to hit those keyboards! But first some ground rules and useful hints:

* You must have Extended Color BASIC (ECB).
* If you have disk, you must have 32K.
* You do *not* need a monitor or assembler.
* ALWAYS save-to-tape or before typing RUN.



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* Type in lines as you see them. DO NOT ADD or SUBTRACT SPACES. This will keep your listing on your CoCo screen exactly like the *Rainbow* listing.
* IF you have a correct *Rainbow Roach* listing, you can save some typing by first loading *Roach* and then deleting lines 0—44 and 50—65. Now, type and enter *RENUM 39,45,1* then add the statements from the *Marathon* listing at the end of line 43 (L$(37) and a "GET"). The programs use the same character sets.
* If you would like a tape of *Marathon* send $4 and a label with your address on it to:

  John Fraysse
  Afabear Software
  Box 822
  Dahlgren, VA 22448

  I'll cover the cassette, postage and handling and try my best to give you next day service. Or if you prefer, send a self-addressed envelope with *adequate* return postage and a blank cassette with $3, whichever is more convenient.
* When calling to discuss problems try to have your computer next to the phone so that we can debug and talk at the same time. Please look through this article's documentation first, especially the "Debugging Section." I will be glad to talk to you after 7:00 p.m. on weekdays, (703-775-7018).
* Finally, as a favor, I would ask that you not give or sell *Marathon* or any other software you have purchased or typed in. As an individual, you have the right to *use* someone else's software (whether purchased or typed in) *not* to give away or sell it. Thanks much!

How To Run A Marathon

For 32K ECB users, simply *CLOAD* "MARATHON" *RUN*. Whether you are loading from a disk or cassette does not matter.

If you have 16K ECB, read this paragraph—otherwise, skip to the next one. Okay, you have 16K. First *CLOAD "MARASET"* and *RUN*. When the OK appears, *CLOAD "MARADRVR"* and *RUN* again to play. *Maraset* and *Maradrvr* are two programs created from *Marathon*. See the special 16K ECB instructions for details. If you wish to press the BREAK key to edit *Maradrvr* only do so when the game status word reads "DIF" or "RUB." This is the only time when the graphic scenes are properly aligned. Re-running *Maradrvr* does not recreate the scenes. (*Maraset* does that.) If you follow this rule, you will be able to edit *Maradrvr* and rerun without reloading and rerunning *Maraset* first. However, if things don't look right, you will have to repeat the *Maraset-Maradrvr* sequence.

After typing RUN, the program headers will appear scrolling up from the bottom of the screen one at a time until a surrounding border is finally in place. The graphic screen is then displayed (see Figure 1) and the four scenes begin to move simultaneously. This is the wait mode. It occurs initially and after each game. Pressing the spacebar exits the wait mode, realigns the scenes and enters the "rub-in" mode (select difficulty level and enter your initials). The area in the center of the screen is the information/score box. The small square to the left edge of the box is the difficulty level. A question mark ("?") and the status word below the box ("DIF") indicate that you should select a difficulty level (1—4). Pressing the "1" through "4" keys will record your selection and move the "?" next to the "ID" label. The status

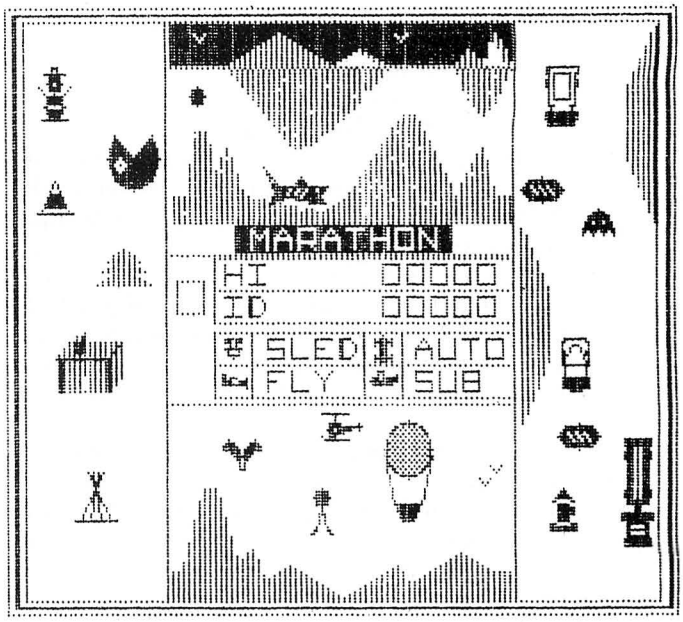
```
 6 .....02B9   40 .....19FD
12 ..... 05CB  44 ..... 1D9A
17 .....09B9   49 .....20B9
22 ..... 0DC8  58 .....24A2
27 ..... 1139  66 .....27B5
34 ..... 1591  END .....2A75
```

```
0 CLEAR360,23999:AD=24000:GOSUB1
1
1 IF T=5 THEN8 ELSE IF T=1 OR T=
3 THEN 2 ELSE 4
2 PUT(PEEK(AD+304),LB)-(PEEK(AD+
304)+10,LB+8),XM,PSET:FORN=LB TO
 UB STEP ST:X=USR0(X):GET(X,N)-(
X+10,N+8),PR,G:IF PPOINT(X+DX,N+
DY)<>0 OR PPOINT(X+DX+1,N+DY)<>0
THEN6ELSEPUT(X,N)-(X+10,N+8),P,O
R:PUT(X,N)-(X+10,N+8),PR,AND:EXE
CA(T):PLAY"V31T255L25505A"
3 NEXTN:N=ABS(N-LB):PLAY"V3102T2
L4AL803DEF+L4EC+":S=S+INT(N*.93)
:GOSUB56:GOSUB59:T=T+1:GOSUB63:G
OTO1
4 PUT(LB,PEEK(AD+304))-(LB+10,PE
EK(AD+304)+8),XM,PSET:FORN=LB TO
 UB STEP ST:Y=USR0(Y):GET(N,Y)-(
N+10,Y+8),PR,G:IFPPOINT(N+DX,Y+D
Y)<>0THEN6ELSE PUT(N,Y)-(N+10,Y+
8),P,OR:PUT(N,Y)-(N+10,Y+8),PR,A
ND:EXECA(T):PLAY"T255L25505A":NE
XTN
5 N=ABS(N-LB):S=S+INT(N*.93):PLA
Y"V3102T2L4AL803DEF+L4EC+":GOSUB
56:GOSUB59:T=T+1:GOSUB63:GOTO1
6 IF T=1 OR T=3 THEN DX=X:DY=N E
LSE DX=N:DY=Y
7 FORJ=0TO3:PUT(DX,DY)-(DX+10,DY
+8),EX,OR:PLAY"V2L30T2005":FORI=
0TO13:PLAY"V+AA+V+":NEXTI:PUT(DX
,DY)-(DX+10,DY+8),PR,AND:NEXTJ:N
=ABS(N-LB):S=S+INT(N*.93):GOSUB5
6:GOSUB59:T=T+1:GOSUB63:GOTO1
8 IF INKEY$=CHR$(32) THEN 9 ELSE
 PLAY"V31T255L25505A":EXECA(1):E
XECA(2):EXECA(3):EXECA(4):N=N+1:
GOTO8
9 RS=500:S=0:N$="":T=1:GOSUB56:T
=2:GOSUB56:T=3:GOSUB56:T=4:GOSUB
56:FORI=0TO DF-2:PUT(TX(I),TY(I)
)-(TX(I)+20,TY(I)+11),XM,PSET:PU
T(MX(I),MY(I))-(MX(I)+6,MY(I)+6)
,XM,PSET:PUT(HX(I),HY(I))-(HX(I)
+10,HY(I)+13),XM,PSET:CIRCLE(152
,138),10,0
10 PUT(BX(I),BY(I))-(BX(I)+14,BY
(I)+9),XM,PSET:NEXTI:GOSUB50:T=1
:GOSUB63:GOTO1
```

```
11 PMODE3,1:PCLS:DRAW"BM1,2C2R25
2D187L252U187BM4,4C4R246D183L246
U183BM8,6C3R239D179L239U179BM63,
7D177BM192,184U177BM192,20M64,20
BM85,20M105,10M125,20M135,15M145
,20C2M130,35M115,45L5M85,20BM170
,20C3E5F5M185,10M190,20C2M185,30
G5H5M170,20"
12 CLS4:B$="AFABEAR"+CHR$(191)+C
HR$(191)+"SOFTWARE"+CHR$(191)+CH
R$(191):FORI=488TO232 STEP-32:CL
S4:PRINT@I,B$;:NEXTI
13 DRAW"BM62,68C2NU8R128M191,60L
6M180,45M170,60M155,35L5M130,60M
120,65M90,60M85,45M80,55M77,40L4
M70,60L6BM64,78C3R128BD1L111D10N
R111D10NR111BD3NR111D10NR111D10R
111BM95,102D20BR41U20BR14D20BM67
,86R10D10L10U10BM192,176L8M172,1
70M152,180BM154,184"
14 DRAW"M149,174M129,184M109,174
M99,179M94,169M89,174M81,150L4M6
8,176L4BM245,8C2M235,28D20M245,6
8BM194,70ND60M204,89D20M194,130B
M49,76C3M45,78R2M43,80R4M41,83R6
M39,87R20M51,83R6M51,80R4M51,78R
2M49,76BM20,110C2NE5NR20D10R20NE
```

word will read "RUB" for rub-in. You must type three *capital letters*—all others are ignored. After entering your initials, the status word reads "RDY" for ready and an illuminating square to the left of the labels SLED, FLY, AUTO, or SUB will appear flashing and playing a short, random note sequence. Also, at this time, your vehicle will appear at its starting position in the appropriate trial area.

Figure 1



Marathon has four trial areas which you must negotiate in order. The RIGHT JOYSTICK controls all of the action. The button is never used. Increasing the difficulty level causes more and more obstacles in your path. With the SLED trial, you get more TREES. With the FLY trial, you get more BIRDMEN. When AUTOing, you have more FIRE HYDRANTS, and while SUBing, you must dodge more of those pesty MINES. When the status word reads "GO" your trial begins, first on the left hand side, the SLED. You move *downward*, the scenery moves *upward*. The next trial is the plane (FLY). You move to the *right*, the scenery moves to the *left*. This is followed by the AUTO. You move *upward*, the traffic moves *downward*. Finally, it's the SUB. You move to the *left*, the undersea world moves to the *right*. Your joystick controls horizontal movement while SLEDing or AUTOing and vertical movement while FLYing or SUBing. You must avoid "NOSE" contact with the scenery. Once the front portion of your vehicle has passed an obstruction you are safely by. Care was taken to make the joystick control exceptionally smooth and responsive, but at the higher levels a good deal of anticipation and split-second timing is required!

Your score is proportional to how long you lasted in each of the four trials and is totaled after each trial. For each 5,000 point increment in score, you will receive a bonus play round (a perfect *Marathon* is 5250). The game status word will read "BNS" and a rising scale is played. After the game has ended, the status word will read "END" and the four scenes will begin to move simultaneously again waiting on SPACEBAR to replay. Pressing the spacebar will realign the scenes and re-prompt the Difficulty/Rub-in sequence.

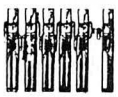
Well, that's your mission . . . a *Marathon* if you should decide to accept it!

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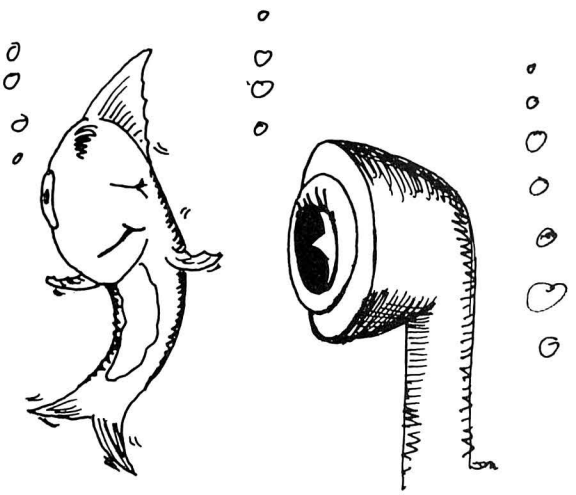
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Special Instructions For 16K ECB Cassette Users

1. Clear your machine by turning it off then on again.
2. Type and ENTER *POKE 25,6* (This will clear all the graphic pages and allow you to use all of your memory for program.)
3. If you have a purchased tape or wish to add to or edit the one you have previously created just *CLOAD*"MARATHON." If you have no tape file as of yet . . . type like crazy until complete or you are exhausted. Do not type RUN until you are instructed. If you wish to stop and rest prior to completion *CSAVE*"MARATHON" and repeat steps 1—3 to continue. When complete, make two copies and put them in a safe place. These are your "master" copies.
4. Now, you must make two programs out of the one master. This is also necessary to debug the two programs. The first program will be the setup code which will create most of the necessary graphics plus *POKE* the ML code into the proper memory locations. Here are the steps assuming the master is loaded:
   * ADD *"CLEAR360,16074"* as the first statement in line 11. Line 11 should read: 11 CLEAR360, 16074:PMODE3,1 . . .
   * ADD "AD=16075" as the first statement in line 30. Line 30 should read: 30 AD=16075:CK=0:FOR I=AD . . .
   * DELETE lines 0—10 then delete lines 36 to the end of the program *(DEL 36—)*
   * *CSAVE* the result as "MARASET"

Now to create the second program—the BASIC driver.



Leave your machine on and reload the master file, "MARATHON." Follow these steps:

   * REDO line 0. Line 0 should read: "AD=16075: GOSUB38"
   * DELETE lines 11—37
   * *CSAVE* the result as "MARADRVR" just a few counts past the end of "MARASET"
   * Cycle your machine off then on again (restores graphic pages)

5. If you started with a purchased cassette, rewind to "MARASET,"*CLOAD* then *RUN*. When the "OK" appears, *CLOAD*"MARADRVR" and *RUN*. *Marathon* is yours!

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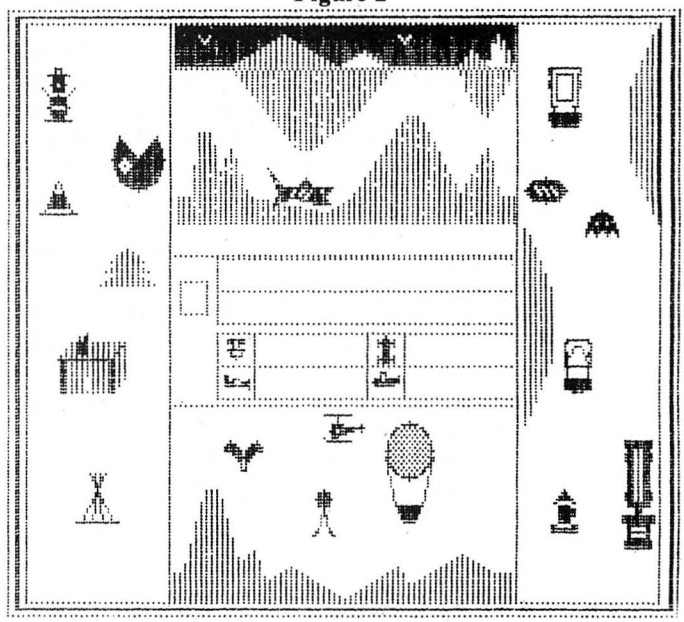
```
5U10E5ND10L20BM28,120U5R4D5"
15 DRAW"BM64,124C3R126":PMODE4,1
:DRAW"BM43,160C1L2M32,145BR2M37,
160L4M36,145BR2M29,160BM27,65L14
R12M20,55M15,65BM20,59NL2NR2BD4N
L4R4BM43,41M50,48M57,41BM15,36R1
0BU10BR1G3BL6H3BU4BR2R8L3U2L2D2"
16 CIRCLE(20,25),3,1:CIRCLE(20,3
2),4,1:CIRCLE(50,48),10,1,1,.875
,.625:CIRCLE(125,132),3,1,1,.25,
.75:CIRCLE(120,153),3,1:CIRCLE(2
03,58),8,1,.5:CIRCLE(224,70),6,1
,1,.5,1:CIRCLE(95,140),5,1,1,.5,
.75
17 CIRCLE(85,140),5,1,1,.75,1:CI
RCLE(83,144),7,1,1,.75,1:CIRCLE(
97,144),7,1,1,.5,.75:DRAW"BM218,
72NU2E2F2E2F2E2F2U2BM27,160M43,1
60":FORI=0TO9:LINE(143+I,138+I)-
(152+I,129+I),PSET:NEXTI:CIRCLE(
152,138),9,1
18 FORI=232TO104STEP-2:PRINT@I,B
$;:NEXTI:B$="PRESENTS":FORI=428T
O172STEP-32:PRINT@I,B$;:PRINT@I+
32,CHR$(191);CHR$(191);CHR$(191)
;CHR$(191);CHR$(191);CHR$(191);C
HR$(191);CHR$(191);:NEXTI
19 DRAW"BM95,135M97,137BM85,135M
83,137BM143,140M147,155NR10M150,
160R4M157,155M161,140BM120,156D2
BM125,129U2L5R10BM125,129M129,13
1R6L1U1D2U1L1M121,135NH1R9BM89,1
07L4R1U2L2U1R6D1L2D2":CIRCLE(129
,158),9,1,1,.37,.5:CIRCLE(87,107
),3,1,1,0,.5
20 DRAW"BM92,117NU1ND2L3H1L2D1L2
U2L1D3R3NU2R6BM143,103NG1ND7F1D7
L2U7D1L1R4BD5L4BL1BD1U2BU3U2BR6D
2BD3D2BM138,117NE1NR9F1R7E2NU1ND
1L5U2L2D2L1BM204,20NR12D2R1NU1D2
L1D2R1NU2D6R2G2L1D2R1NU2D2R10U2R
1U2L1NL10ND2H2R2U6R1U2L1ND2U2R1U
2D2BM207,22D8R6U8L6"
21 DRAW"BM211,104D1L1D3R1D1L1D3R
1D4L1D3R3D1R4U1R3U3L1U4R1U3L1U1R
1U3L1U1L8BM220,116L10BU4M214,106
R2M219,112L8BM233,135NR10D2R1D2L
1D2R1D10L1D2R1D2R3D3L5D2R2D6L1D2
R10U2L1U6R2U2L5U3R3U2R1U2L1U10R1
U2L1U2R1U2":CIRCLE(111,158),9,1,
1,0,.15
22 PMODE3:DRAW"BM86,21C2R56BM171
,21R18BM64,20C3M191,20":PAINT(90
,10),4,3:PAINT(115,30),2,2:PAINT
(150,60),2,2:PAINT(180,25),2,2:P
AINT(105,15),3,3:PAINT(175,18),3
,3:PMODE4:FORI=0TO80:PSET(65+RND
(60)*2,22+RND(43),0):NEXTI:DRAW"
```

6. If you have typed the program in, I suggest that you first get the setup program right ("MARASET"). To help you do this, I suggest that you add line 36 as follows:

36 SCREEN1,1:GOTO36

The *FOR/NEXT* loop in line 30 sum checks your ML code. It is properly entered when the value for CK is 31681. If not, an error message will result (see Debugging Hints for details). The screen command that you added as line 36 will let you see the graphics you have created. They should look like Figure 2 below. When "MARASET" is correct, note your corrections and *CSAVE* to tape. you should later edit the master and make the same corrections. You should also delete line 36 when you have finished debugging.

Figure 2



7. Now *CLOAD* your correct "MARASET" program and *RUN* then *CLOAD*"MARADRVR" and *RUN*, but stand by on the SHIFT@ keys. As soon as you see the graphics, pause the program. Does the lettering look OK? It should now look like Figure 1. If it does, congratulations, press any key and proceed. If not, start debugging, noting ALL your corrections. After you get it right, *CSAVE*"MARADRVR" to tape.

8. You should really go back and correct the master *(Marathon)* file. One day you might have a disk and/or more memory. The *Marathon* file would then be the one of choice.

9. Here is what your 16K ECB memory looks like after running both programs:

DEC ADR	HEX ADR	
1536	600	*MARASET* STORES THE NECESSARY GRAPHICS HERE
7680	1E00	*MARADRVR*—THE BASIC DRIVER—RESIDES HERE AND OPERATES ON THE FOUR GRAPHIC PAGES VIA THE ML SUBROUTINES
16075	3EC6	*MARASET* STORES ML HERE
16383	3FFF	



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S K I L L W A R E

10. The reason this technique works is that only the BASIC program area is overwritten. The graphics and ML left behind by *Maraset* are *not changed.*

Debugging Hints

The majority of all errors you will inadvertently type into *Marathon*, or any other program, for that matter, will be SN (syntax) or FC (function call) errors. I will assume that you will find and correct all of your SN errors as they could be caused by almost anything. But I will treat FC and OD errors as they pertain specifically to *Marathon*, my ultimate of these errors so that you may correct most of them yourself. goal being to help you better understand the causes Now, I know this is "old hat" to lots of you who may wish to skip this section, but many apparently could benefit from a few paragraphs on this subject. So here they are.

Function Call Errors

FC (function call) errors in *GET, PUT, DRAW, PLAY* and *LINE* commands are always caused by asking these guys to do something they can't. The most likely causes are as follows:

* Coordinates out of range: horizontal and vertical must be POSITIVE with the horizontal less than 256 and the vertical less than 192. EX: PUT(X+4,Y+4)-(X-4,Y-4),A,PSET, where X=0 and Y>4. Let's see; X-4 would equal -4. NO CAN DO!

* Dimensions of the *PUT* not equal to the dimensions of the *GET*. EX: GET (X+4,Y+4)-(X-4,Y-4),A,G. Then somewhere else in a following line . . . PUT(X+4,Y+4)-(X-2,Y-4), A,PSET where X=10, Y=10. Since the arithmetic statements X-4 and X-2 do not match, this pair will usually produce either a FC or the gosh-awfulest graphics you have ever seen!

* Execution of a string with an illegal character in it. EX: DRAW"BM100, 100;XL$(2);" where L$(2)="D2L2P2." There is nothing wrong with the *DRAW* statement; however, the *STRING* it is trying to execute has an unrecognizable character in it, "P2." The result is a FC error. Since a string can be any printable character, BASIC has no way to know that you were going to use the string in a *DRAW* statement. You might have wanted just to PRINT L$(2) which would be perfectly legal. In addition, if the *DRAW* command is at line 500 and then the L$(2) string was defined, say in line 10, the source of your problems could be vastly removed from where you got your FC error.

When you get a FC error you can ask your CoCo to tell you any of the variables in the program if you do not ask it to do anything else like *EDIT* or *LIST*, etc. In the example above with the *GET/PUT* FC error you could type, ?X,Y ENTER. These two numbers returned would be none other than X and Y. Now do these look right? Then check where the array was gotten and check the NAMES of the graphic arrays in the *GET, PUT,* and *DIM* statements.

You can also insert a *STOP* command wherever you want and the computer will stop. You may then ask it questions. When you wish to continue typing enter *CONT*. This insertion of *STOP* commands is referred to as adding *breakpoints.*

Poking the ML Code (OD errors)

OD, or out of data, errors are caused by insufficient data in the *DATA* statements. In line 30, I have inserted an automatic sum check of all the ML code. If you get an OD error you will know that you have missed some entries. If the error message from BASIC results, ("ERROR IN DATA STATEMENTS") the first number is the sum check (should be 31681) and the second is the value of the last number read in case you put in too many. Between BASIC's checks and this one I have installed and *Rainbow Check* (RBOWCHEK) you should be able to get this part right.

Catastrophic Paint

The ECB *PAINT* command can be very dangerous because it is very picky. If you wish to paint an object it must have its outline closed on itself otherwise the painting will

"leak out" and paint everything else. Sometimes this completely wipes out your carefully detailed scene, although an error will *not* result. You will rarely be pleased with what you get. Therefore, if you mistype coordinates of a *PAINT* or mistype the coordinates of the object to be painted, wild things could happen to your graphics. Try inserting GOTO 100 before suspect *PAINTs* where 100 reads: 100 SCREEN1, 1:GOTO100. This will let you see the graphics. Then move the GOTO100 statement around until you locate the rogue *PAINT*. Now check the coordinates and color codes for correctness. Then try to find where the scene or object was generated—maybe you have an error there. If all else fails, delete the *PAINT* command giving problems and go on debugging the rest of the program. Make a note of this and return to the problem after all else is in order. Oh yes, don't forget to *remove your added statements* after you are through debugging.

***** MAIN PROGRAM *****

LINE 0 INITIAL SETUP (GOSUB11)

LINE 1 DETERMINE ANIMATION LOOP BY TRIAL INDICATOR (T)

LINE 2—3 VERTICAL ANIMATION LOOP/SUCCESS IF LOOP COMPLETED THEN GOSUB56 (ALIGN) GOSUB59 (SCORE) GOSUB63 (ASSIGN) GOTO1 ELSE EXIT TO CRASH LINES 6—7

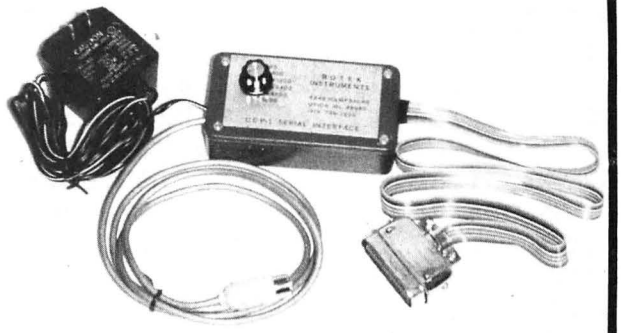
LINE 4—5 HORIZONTAL ANIMATION LOOP/SUCCESS IF LOOP COMPLETED THEN GOSUB (ALIGN) GOSUB59 (SCORE) GOSUB63 (ASSIGN) GOTO1 ELSE EXIT

```
BM75,12CØNH2E2BM15Ø,12NH2E2"
23 FORJ=ØTO14STEP2:READC:FORI=J+
457 TO J+265 STEP-32:PRINT@I,CHR
$(C);:PRINT@I+32,CHR$(191);:NEXT
I,J:DRAW"BM12Ø,62C1NL4R2M12Ø,6ØM
123,57M116,57H3G3L5M99,51M1Ø3,59
M1Ø1,62M1Ø8,6ØM12Ø,62":PAINT(113
,58),1,1:PSET(119,58,Ø):DRAW"BM1
Ø8,59CØE1BR3G1"
24 DRAW"BR3B61E2C1":PMODE3:DRAW"
BM245,8C2D6Ø":PAINT(242,35),2,2:
PAINT(198,95),2,2:PMODE4:PAINT(2
24,67),1,1:PSET(222,68,Ø):PSET(2
26,68,Ø):PAINT(2Ø3,58),1,1:PAINT
(21Ø,36),1,1:DRAW"BM21Ø,15ØC1F4L
2D2R2D2L2D3R3D2L1ØU2R3U7L2E4BM2Ø
1,59CØNH2BR3NH2BR3NH2"
25 PAINT(24Ø,145),1,1:PAINT(21Ø,
155),1,1:PAINT(21Ø,118),1,1:PAIN
T(215,118),1,1:DRAW"BM237,138CØD
15BR2U15BM2Ø8,154R4BD7L4BM236,16
2R4BD2L4C1":PAINT(125,132),1,1:P
AINT(12Ø,153),1,1:PAINT(93,137),
1,1:PAINT(87,137),1,1:PAINT(152,
157),1,1
26 PSET(125,132,Ø):PMODE3:PAINT(
8Ø,17Ø),3,3:PAINT(17Ø,178),3,3:P
```


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```
AINT(47,85),3,3:PAINT(145,180),3
,3:PAINT(30,107),2,2:PAINT(42,11
3),2,2:PAINT(35,113),2,2:PMODE4:
PAINT(45,52),1,1:PAINT(20,25),1,
1:PAINT(20,32),1,1:PAINT(20,61),
1,1:CIRCLE(45,50),2,0
27 DRAW"BM28,108NU5R2NU5E1U5BM40
,110C1NE4ND10L20BM18,32C0R4BM63,
60D8L1C1U8BM22,110D10":PSET(20,2
5,0)
28 PRINT@367,"BY";:PRINT@426,"JO
HN"+CHR$(191)+CHR$(191)+"FRAYSSE
";:PRINT@492,"1983"+CHR$(191)+"(
C)";:FORI=0TO480STEP32:PRINT@I,C
HR$(150);:PRINT@I+31,CHR$(150);:
NEXTI:FORI=0TO30:PRINT@I,CHR$(15
0);
29 PRINT@I+480,CHR$(150);:NEXTI:
SCREEN0,1:DATA 109,97,114,97,116
,104,111,110
30 CK=0:FORI=AD TO AD+300:READJ:
CK=CK+J:POKEI,J:NEXTI:IF CK<>316
81 THEN CLS:PRINT "ERROR IN DATA
 STATEMENTS",CK;J:STOP
31 DATA 173,159,160,10,230,141,1
,37,39,5,246,1,91,32,3,246,1,90,
203,8,84,84,84,84,192,2,235,141,
1,18,225,141,1,12,37,13,225,141,
1,7,34,18,231,141,1,2,79,32,20,2
30,141,0,249,231,141,0,247,79,32
,9,230,141,0,239,231,141,0,236,7
9,189,180,244,57,142,7,87,19
32 DATA 15,166,132,70,70,70,132,
192,52,2,166,132,68,68,52,2,166,
31,70,70,70,132,192,170,224,167,
132,48,31,90,38,234,166,132,68,6
8,170,224,167,132,48,136,47,140,
14,55,47,207,57,142,21,232,198,1
5,166,132,73,73,73
33 DATA 132,3,52,2,166,132,72,72
,52,2,166,1,73,73,73,132,3,170,2
24,167,128,90,38,236,166,132,72,
72,170,224,167,132,48,136,17,140
,29,40,38,209,57,142,7,1,198,7,1
66,128,52,2,90,38,249,48,136,25,
140,7
34 DATA 65,38,239,142,7,65,198,7
,166,128,167,136,191,90,38,248,4
8,136,25,140,29,1,38,238,142,28,
232,198,7,53,2,167,130,90,38,249
,48,136,231,140,28,168,38,239,57
,142,28,248,198,7,166,128,52,2,9
0,38,249,48,136,217,140
35 DATA 28,184,38,239,142,28,184
,198,7,166,128,167,136,63,90,38,
248,48,136,217,140,6,248,38,238,
142,7,31,198,7,53,2,167,130,90,3
8,249,48,136,39,140,7,95,38,239,
57
```

TO CRASH (LINES 6—7)

LINE 6—7 CRASH SEQUENCE/NEW TRIAL

LINE 8 GAME OVER/WAIT ON <SPACE-BAR>

LINE 9—10 INITIALIZE NEW GAME/GOTO 1

***** END MAIN *****

***** GRAPHICS/ML SUBROUTINE *****

LINE 11 GRAPHICS

LINE 12—17 #1 HEADER/MORE GRAPHICS

LINE 18—22 #2 HEADER/MORE GRAPHICS

LINE 23—29 #3 HEADER/MORE GRAPHICS

LINE 30—35 POKE IN ML CODE

LINE 36—37 DISK OPTION

LINE 38 DIM'S/DEFUSR0 ADDRESS FOR JOY-STICK ML SUBROUTINE

LINE 39—43 CHARACTER/NUMERAL SET

LINE 44—45 DRAW LETTERS AND NUMBERS

LINE 46—47 GET OBSTACLES/DEFINE OBSTA—CLE COORDINATES AND ADR'S FOR THE FOUR SCENERY MOVE ML SUB-ROUTINES

LINE 48 INITIAL WAIT ON <SPACEBAR>

LINE 49 REALIGN SCENES/DO DIF/RUB-IN SE-QUENCE/ASSIGN INITIAL TRIAL/RE-TURN TO 1

***** DIFFICULTY/RUBIN SUBROUTINE *****

LINE 50 DISPLAY "DIF" STATUS WORD AND "?"

LINE 51 POLL KEYBOARD FOR A 1 TO 4 ENTRY

LINE 52 DISPLAY "RUB" STATUS WORD AND "?"

LINE 54—55 PUT OBSTACLES DEPENDING ON "DIF" THEN RETURN

***** SCENERY ALIGNMENT SUBROUTINE *****

LINE 56 DETERMINE WHICH TRIAL (T)

LINE 57 CALCULATE THE OUT OF ALIGN-MENT COUNTER (IC) FOR SLED OR AUTO, ALIGN SCENE THEN RETURN

LINE 58 CALCULATE THE OUT OF ALIGN-MENT COUNTER (IC) FOR FLY OR SUB, ALIGN SCENE THEN RETURN

***** SCORE/HI SCORE ROUTINE *****

LINE 59—62 CONVERT SCORE TO GRAPHIC ELE-MENTS/PUT ON SCREEN AND CHECK IF SCORE IS HI SCORE IF SO DO HI SCORE THEN RETURN

***** ASSIGN TRIAL PARAMETERS/"READY" DISPLAY/BONUS SUBROUTINE *****

LINE 63—67 BRANCH TO APPROPRIATE INITIAL-IZATION ON (T) IF END (T=5) CHECK FOR BONUS PLAY

LINE 68—71 CREATE ILLUMINATING DISPLAY EMPHASIZING THE NEXT TRIAL/PUT NEXT VEHICLE AT START POINT/DISPLAY "RDY"/PLAY "READY-TO-PLAY" NOTES DISPLAY "GO" THEN RETURN

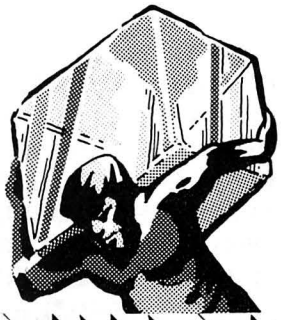
LINE 72—73 CHECK FOR BONUS/AWARD BONUS IF TRUE RESET TRIAL (T=1 THEN RETURN

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36 IF PEEK(&HC000)=68 AND PEEK(&
HC001)=75 THEN 37 ELSE 38
37 POKEAD+74,15:POKEAD+121,22:PO
KEAD+127,29:POKEAD+172,37:POKEAD
+178,15:POKEAD+193,15:POKEAD+198
,15:POKEAD+214,37:POKEAD+219,36:
POKEAD+234,36:POKEAD+240,36:POKE
AD+255,36:POKEAD+260,36:POKEAD+2
76,14:POKEAD+281,15:POKEAD+296,1
5
38 DIM L$(37),XM(13),P(2),PR(2),
TR(6),B(3),H(3),M(1),EX(2),TX(2)
,TY(2),BX(2),BY(2),HX(2),HY(2),M
X(2),MY(2),A(4),LC(1):DRAW"BM125
,50NH4NU4NE4NR4NF4ND4NG4NL4":GET
(120,46)-(130,54),EX,G:PUT(120,4
6)-(130,54),XM,PSET:DEFUSR0=AD
39 L$(1)="BM+2,0;R1D6L3R6;BM+3,-
6":L$(2)=";D1U1R6D3L6D3R6;BM+3,-
6":L$(3)=";R6D3L4R4D3L6;BM+9,-6"
:L$(4)=";D3R6L1U3D6;BM+3,-6":L$(
5)=";R6L6D3R6D3L6U1;BM+9,-5":L$(
6)=";D6R6U3L6;BM+9,-3":L$(7)=";D
1U1R6D6;BM+3,-6":L$(8)=";R6D6L6U
3R6L6U3;BM+9,0"
40 L$(9)=";R6D6U3L6U3;BM+9,0":L$
(0)=";R6D6L6U6;BM+9,0":L$(11)=";
BM+0,+6;U3E3F3L6R6D3;BM+3,-6":L$
(12)=";R6D3L6R6D3L6U6;BM+9,0":L$
(13)="BM+6,+1;U1L6D6R6U1;BM+3,-5
":L$(14)=";R4F2D2G2L3U6L1D6;BM+9
,-6":L$(15)=";R6L6D3R3L3D3R6;BM+
3,-6"
41 L$(16)=";R6L6D3R3L3D3;BM+9,-6
":L$(17)=";BM+6,+1;U1L6D6R6U3L3D
1;BM+6,-4":L$(18)=";BM+0,+0;D6U3
R6U3D6;BM+3,-6":L$(19)=";R6L3D6L
3R6;BM+3,-6":L$(20)=";R6L3D6L3U2
;BM+9,-4":L$(21)=";D6U1E5;BM+1,+
6;H3F3;BM+3,-6":L$(22)=";D6R6;BM
+3,-6"
42 L$(23)=";D6U6F3E3D6;BM+3,-6":
L$(24)=";D6U6F6U6;BM+3,0":L$(25)
=";R6D6L6U6;BM+9,0":L$(26)=";R6D
3L6U3D6;BM+9,-6":L$(27)=";R6D6H3
F3L6U6;BM+9,0":L$(28)=";R6D4L2F2
H2L4D2U6;BM+9,0":L$(29)=";R6L6D3
R6D3L6;BM+9,-6":L$(30)=";R6L3D6;
BM+6,-6"
43 L$(31)=";D6R6U6;BM+3,0":L$(32
)=";D3F3E3U3;BM+3,0":L$(33)=";D6
E3F3U6;BM+3,0":L$(34)=";F6H3G3E6
;BM+3,0":L$(35)=";F3E3G3D3;BM+6,
-6":L$(36)=";D1U1R6G6R6U1;BM+3,-
5":L$(10)=";BM+4,0":L$(37)=";ND1
R4D1G2BD2D1":GET(195,54)-(211,62
),H,G
44 DRAW"BM84,81C1;XL$(18);XL$(19
```

LINE 74 CREDITS
***** END OF LISTING *****

VI. *** LIST OF VARIABLES ***

*** REGULAR VARIABLES ***

RS	REFERENCE SCORE USED TO DETERMINE BONUS PLAY
AD	ADDRESS OF BEGINNING OF ML ROUTINES
T	TRIAL INDICATOR 1—SLED:2—FLY:3—AUTO:4—SUB
LB	LOWER BOUND OF ANIMATION LOOP
UB	UPPER BOUND OF ANIMATION LOOP
ST	STEP OF ANIMATION LOOP
X	HORIZONTAL POSITION OF PLAYER
Y	VERTICAL POSITION OF PLAYER
DX	HORIZONTAL OFFSET FOR TEST OF PLAYER ARRAY (P) COLLISION
DY	VERTICAL OFFSET FOR TEST OF PLAYER ARRAY (P) COLLISION
N	ANIMATION LOOP COUNTER ALSO USED AS VERTICAL OR HORIZONTAL COORDINATE OF PLAYER ARRAY (P) DEPENDING ON WHICH LOOP THE ANIMATION IS IN
I	MULTI-PURPOSE COUNTER
J	MULTI-PURPOSE COUNTER
IC	LOOP COUNTS THAT THE SCENES MUST GO THROUGH TO BE ALIGNED
S	CURRENT SCORE
SX	HIGH SCORE
IH	HI SCORE FLAG (IH=1 --> HIGH SCORE ACHIEVED)
XD	HORIZONTAL ILLUMINATING DISPLAY COORDINATE
YD	VERTICAL ILLUMINATING DISPLAY COORDINATE
CK	SUM CHECK OF ML CODE (CK=31681 IF CORRECT

*** STRINGS ***

B$	MULTI-PURPOSE STRING
N$	INITIALS OF CURRENT PLAYER
NX$	INITIALS OF HI SCORE PLAYER
S$	SCORE CONVERTED TO A STRING FOR SCREEN DISPLAY
L$(37)	CHARACTER/NUMERAL SET + A "?"

*** ARRAYS ***

LC(1)	NUMBER OF LOOP COUNTS IN EITHER THE VERTICAL (0) OR HORIZONTAL (1) SCENES
A(4)	ADDRESSES OF THE FOUR SCENERY-MOVING ML ROUTINES
XM(13)	GRAPHIC MULTI-PURPOSE BLANKING ARRAY
EX(2)	GRAPHIC EXPLOSION ARRAY
TR(6)	GRAPHIC ARRAY CONTAINING TREES
B(3)	GRAPHIC ARRAY CONTAINING BIRDMEN
H(3)	GRAPHIC ARRAY CONTAINING FIRE HYDRANTS
M(1)	GRAPHIC ARRAY CONTAINING MINES
TX(2)	HORIZONTAL COORDINATES OF TREE OBSTACLES

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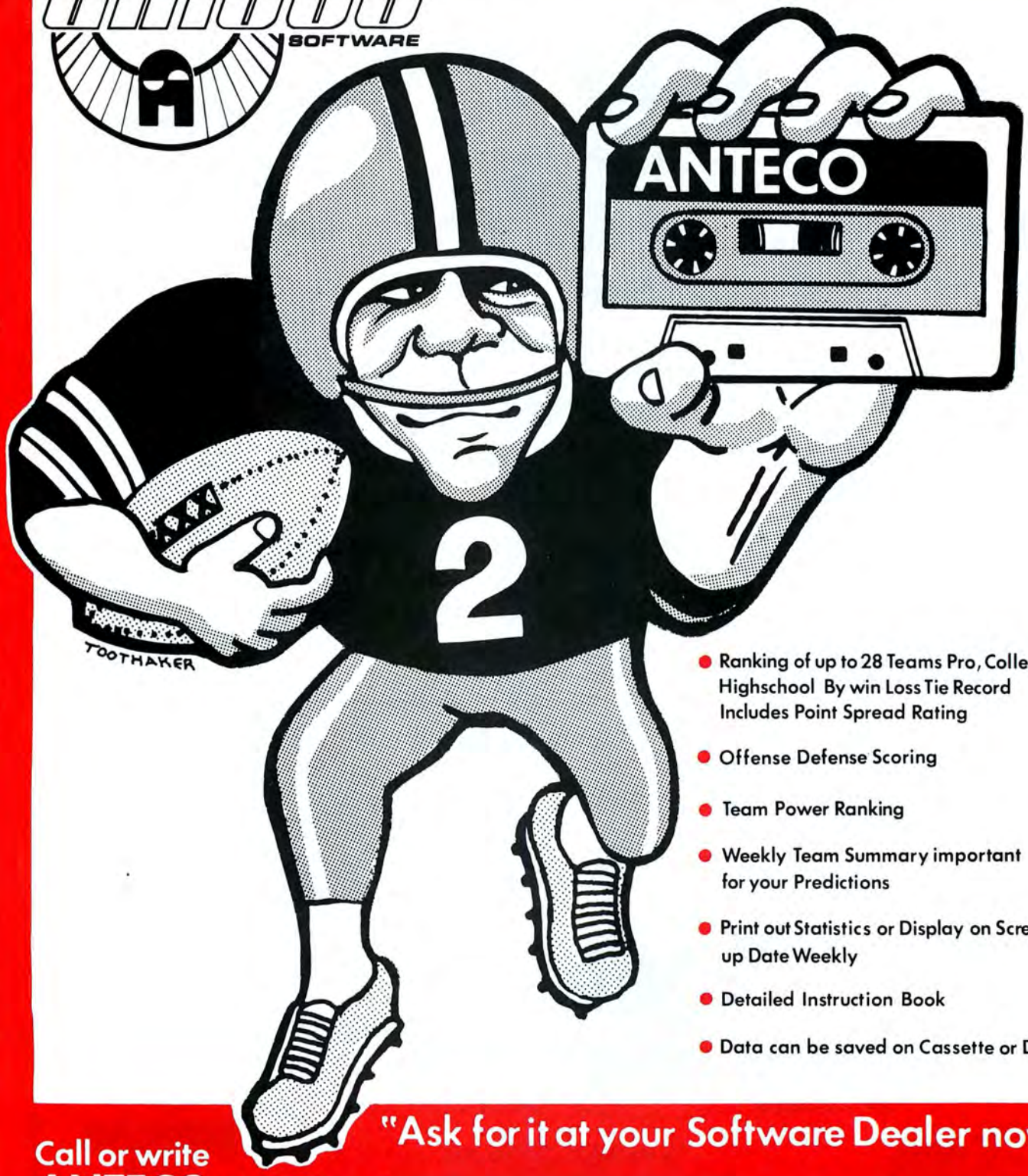
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Marathon Program Commentary

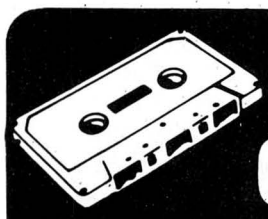
Some of you might have already noticed that much of the programming philosophy used in *Rainbow Roach* has been used in *Marathon*. This is, indeed, true and, in fact, many of the variable names are exactly the same as well as most of the techniques used. This apparent lack of originality is actually a significant strength in most cases, especially in reducing the time necessary to develop new software.

The more standardized your techniques become for doing a particular function, the more you will be able to do them as "second nature" allowing more time to think about new and more complex tasks. Some examples include: a standard method of input for player difficulty level and initials; a standard character and numeral set; a standard header display; and a standard procedure for on-screen score keeping. With these little subtasks thoroughly understood and well documented, you may use them again and again if you made them general enough in application. You may even want to adopt a specific set of variable names to indicate certain quantities in all of your programs. An example would be "S" as score. Then, if you discover a more efficient way of doing something, a modification will be much simpler to implement and easier to understand.

My commentary concerning *Marathon* will be concentrated in three primary areas most of which are not common to the *Rainbow Roach* tutorial (June 1983). These include Program Structure, Graphic Techniques and ML Subroutines.

```
);BM143,81;XL$(0);XL$(0);XL$(0);
XL$(0);XL$(0);BM84,91;XL$(19);XL
$(14);BM143,91;XL$(0);XL$(0);XL$
(0);XL$(0);XL$(0);BM100,104;XL$(
29);XL$(22);XL$(15);XL$(14);BM15
5,104;XL$(11);XL$(31);XL$(30);XL
$(25);"
45 LINE(88,69)-(169,77),PSET,BF:
DRAW"BM100,114;XL$(16);XL$(22);X
L$(35);BM155,114;XL$(29);XL$(31)
;XL$(12);BM94,70C0;XL$(23);XL$(1
1);XL$(28);XL$(11);XL$(30);XL$(1
8);XL$(25);XL$(24);C1;BM185,145N
H2NE2BG4NH2E2":PUT(208,130)-(224
,138),H,PSET
46 GET(117,150)-(123,156),M,G:GE
T(83,135)-(97,144),B,G:GET(205,1
50)-(215,163),H,G:GET(38,76)-(58
,87),TR,G:RS=500:TX(0)=33:TY(0)=
17:TX(1)=11:TY(1)=130:TX(2)=40:T
Y(2)=125:MX(0)=122:MY(0)=45:MX(1
)=165:MY(1)=32:MX(2)=95:MY(2)=40
:HX(0)=220:HY(0)=13
47 HX(1)=221:HY(1)=46:HX(2)=222:
HY(2)=88:BX(0)=165:BY(0)=156:BX(
1)=125:BY(1)=167:BX(2)=101:BY(2)
=141:A(1)=AD+177:A(2)=AD+126:A(3
)=AD+239:A(4)=AD+73:LC(0)=88:LC(
1)=64:PUT(71,26)-(77,32),M,PSET:
SCREEN1,1:FORI=0TO700:NEXTI
48 IF INKEY$=CHR$(32) THEN 49 EL
SE PLAY"V31T255L25505A":EXECA(1)
:EXECA(2):EXECA(3):EXECA(4):N=N+
1:GOTO48
49 T=1:GOSUB56:T=2:GOSUB56:T=3:G
OSUB56:T=4:GOSUB56:GOSUB50:T=1:G
OSUB63:RETURN
50 N$="":I=0:PUT(68,88)-(75,94),
XM,PSET:PUT(69,98)-(75,122),XM,P
SET:DRAW"BM69,88C1;XL$(37);BM69,
98;XL$(14);BM69,106;XL$(19);BM69
,114;XL$(16);"
51 PLAY"V31T10L1005A01C":B$=INKE
Y$:IFB$=""THEN51ELSEIFASC(B$)<49
ORASC(B$)>52THEN51ELSEDF=VAL(B$)
:PUT(68,88)-(75,94),XM,PSET:DRAW
"BM68,88;XL$(DF);":PUT(107,91)-(
185,97),XM,PSET:PUT(69,98)-(75,1
22),XM,PSET
52 DRAW"BM69,98;XL$(28);BM69,106
;XL$(31);BM69,114;XL$(12);BM102,
91;XL$(37);BM143,91;XL$(0);XL$(0
);XL$(0);XL$(0);XL$(0);"
53 PLAY"05A01C":B$=INKEY$:IF B$=
""THEN53ELSEIF ASC(B$)<65 OR ASC
(B$)>90 THEN53ELSE N$=N$+L$(ASC(
```

```
B$)-54):DRAW"BM109,91;XN$;":I=I+
1:IFI=3THEN PUT(69,98)-(75,122),
XM,PSET:PUT(102,91)-(108,97),XM,
PSET:PUT(69,98)-(75,122),XM,PSET
 ELSE 53
54 IF DF<2 THEN RETURN ELSE FORI
=0TO DF-2:PUT(TX(I),TY(I))-(TX(I
)+20,TY(I)+11),TR,PSET:PLAY"L120
2AB":PUT(MX(I),MY(I))-(MX(I)+6,M
Y(I)+6),M,PSET:PLAY"L1202AB":PUT
(HX(I),HY(I))-(HX(I)+10,HY(I)+13
),H,PSET:PLAY"L1202AB"
55 PUT(BX(I),BY(I))-(BX(I)+14,BY
(I)+9),B,PSET:PLAY"L1202AB":NEXT
I:RETURN
56 ON T GOTO 57,58,57,58
57 IC=LC(0)-N+INT(N/LC(0))*LC(0)
:IF IC=LC(0) THEN RETURN ELSE FO
RI=1TO IC:EXECA(T):NEXTI:RETURN
58 IC=LC(1)-N+INT(N/LC(1))*LC(1)
:IF IC=LC(1) THEN RETURN ELSE FO
RI=1TOIC:EXECA(T):NEXTI:RETURN
59 B$="":S$=STR$(S):LX=LEN(S$):I
F LX=4 THEN B$=L$(0)ELSEIF LX=3
THEN B$=L$(0)+L$(0)ELSEIF LX=2 T
HEN B$=L$(0)+L$(0)+L$(0)
60 FORI=2TOLX:B$=B$+L$(VAL(MID$(
```

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Program Structure

Three factors influenced the structure of the *Marathon* coding.

First was the desire to have the animation as fast as possible without the *POKE 65495,0* CPU speedup or a BREAK key disable. Therefore, the line numbers were sequentially numbered by ones and the animation loops placed as close as possible to the beginning of the program. Both loops are located in the first six lines of code. When BASIC encounters a *NEXT*, it starts looking for a *FOR* statement. The closer the *FOR* statement is to the beginning of the listing and the smaller the numbers it has to search through, the faster the loop. The speed attained is satisfactory updating at a 6 HZ rate which is faster than a lot of people's reaction time.

Secondly, I wanted the convenience and flexibility afforded by wholesale SUBROUTINING. In this way, it was easier to think logically about the tasks involved. Consider the diagram below:

MAIN PROGRAM
BASIC
(LINES 0—10)

ML	JOYSTICK SAMPLE
ML	MOVE SUB SCENE
ML	MOVE FLY SCENE
ML	MOVE SLED SCENE
ML	MOVE AUTO SCENE
BASIC	RUB-IN
BASIC	SCENERY ALIGN
BASIC	SCORE/HI-SCORE
BASIC	ASSIGN TRIAL PARAMETER "READY" AND BONUS

Subroutines Keep The Main Program Simple

By letting a ML subroutine sample the joysticks and generate either the vertical or horizontal coordinates necessary to produce X-Y motion, I was able to get by with two (not four) very similar animation loops. One loop for vertical and one for horizontal animation. The bounds of the loops are variables ("LB" and "UB") as well as the steps of the loops ("ST"). Therefore, I can start and end the animation anywhere I want and go forward or backward depending on the sign of ST. In the vertical loop (LINES 2—3), the USR0 function returns the horizontal coordinate "X." In the horizontal loop (LINES 4—5) the USR0 returns the vertical coordinate "Y." In both cases, the coordinate not defined by the USR0 is defined by the animation loop counter "N." Thus, the USR0 intializes the missing coordinate and increments its value at a RATE proportional to the right joystick position and then limits the output. This is a slow process in BASIC requiring a JOYSTK(0), adds, subtracts, multiplies, divides and logical tests. It takes <.01 seconds in ML.

The other four ML subroutines move their respective blocks of graphics two pixels at a time up, down, right and left and wrap the scenery around. This eliminated the need to produce different graphics and greatly simplified the ML code while saving bunches of graphic memory.

Now, what about the BASIC subroutines? First of all, none are in the animation loop as *GOSUB's* are very slow. But no one cares after the action has stopped. So they do things *between* the four trials. These include realigning the scenes, calculating and displaying the score, assigning animation loop parameters, and inputting the difficulty levels and initials.

As an aside, you may be asking yourself "Why do you need to realign the graphic scenes?" It is because of difficulty levels. Since higher difficulty levels mean more objects and that you will need to ERASE these objects to change levels,

"You may even want to adopt a specific set of variable names to indicate certain quantities in all of your programs."

you must have some way of knowing where they are. This can be done by counting the number of times through the animation loop and adding this quantity to original coordinates. But what if the scene STOPS when an object is partially wrapped around? The best method of *PUTting* or erasing things on a wrap-around scene is to always align the scene to its original position. This way the "partial wrap" problems go completely away. The method also provides consistency from game to game without destroying any graphic elements. Once again this is the concept of "single-synthesis" graphics used in *Roach*.

The third and final reason for the structure of *Marathon* was the realization, even before I began to write the program, that it would not fit into 16K as is. Thus, I designed a stand-alone graphics/ML module between lines 11 and 35, inclusive. These lines, with very simple modifications, become the graphics/ML setup program *Maraset*. Note that it contains no *GETs, PUTs, DIMs* or character set. It is 99 percent of all the graphics (minus the lettering) and all of the ML code and text headers. The remainder of the program (lines 0—10 and 38—74) makes up the BASIC driver—*Maradrvr*. The idea of the two programs was simply to provide a means to operate a 20K program in 16K and, therefore, allow anyone with ECB (except 16K ECB Disk) to play *Marathon*.

Graphics Techniques

First, let me say that there is little in *Marathon* in terms of graphics which is not general knowledge to many of you. But, there are three areas I would like to address before we go on to the commentary on ML. These are *DRAWs*, the "1 to 2" rule and generating two "new" color patterns.

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```
S$,I,1))):NEXTI:IF IH=1 THEN61 E
LSE PUT(107,91)-(185,97),XM,PSET
:DRAW"BM107,91;XN$;BM143,91;XB$;
XL$(0);":GOTO62
61 PUT(107,81)-(185,87),XM,PSET:
DRAW"BM107,81;XNX$;BM143,81;XB$;
XL$(0);":IH=0:RETURN
62 IF SX>=S THEN RETURN ELSE IH=
1:SX=S:S=SX:NX$=N$:GOTO59
63 ON T GOTO 64,65,66,67,72
64 GET(82,103)-(92,111),P,G:POKE
AD+301,0:POKEAD+302,8:POKEAD+303
,53:POKEAD+304,30:DX=5:DY=8:LB=1
0:UB=175:ST=1:PUT(30,10)-(40,18)
,P,PSET:GOTO68
65 GET(82,113)-(92,121),P,G:POKE
AD+301,1:POKEAD+302,125:POKEAD+3
03,176:POKEAD+304,140:DX=11:DY=4
:LB=65:UB=180:ST=1:PUT(64,140)-(
74,148),P,PSET:IF DF=4 THEN CIRC
LE(152,138),10,1:GOTO68 ELSE GOT
068
66 GET(138,103)-(148,111),P,G:PO
KEAD+301,0:POKEAD+302,192:POKEAD
+303,237:POKEAD+304,220:DX=5:DY=
0:LB=174:UB=8:ST=-1:PUT(220,174)
-(230,182),P,PSET:GOTO68
67 GET(138,113)-(148,121),P,G:PO
KEAD+301,1:POKEAD+302,18:POKEAD+
303,55:POKEAD+304,38:DX=0:DY=4:L
B=181:UB=64:ST=-1:PUT(181,38)-(1
91,46),P,OR
68 XD=82:IF T>2 THEN XD=138
69 YD=103:IF (T/2-INT(T/2))=0 TH
EN YD=113
70 PUT(69,98)-(75,122),XM,PSET:D
RAW"BM69,98;XL$(28);BM69,106;XL$
(14);BM69,114;XL$(35);":FORI=0TO
20:PUT(XD,YD)-(XD+10,YD+8),P,NOT
:SOUND RND(235),1:PUT(XD,YD)-(XD
+10,YD+8),P,PSET:NEXTI:PUT(69,98
)-(76,122),XM,PSET:DRAW"BM69,98;
XL$(17);BM69,106;XL$(25);"
71 RETURN
72 IF (S-RS)>=0 THEN 73 ELSE PUT
(69,98)-(75,122),XM,PSET:DRAW"BM
69,98;XL$(15);BM69,106;XL$(24);B
M69,114;XL$(14);":N=0:RETURN
73 RS=RS+540:PUT(69,98)-(75,122)
,XM,PSET:DRAW"BM69,98;XL$(12);BM
69,106;XL$(24);BM69,114;XL$(29);
":T=1:FORI=1TO200 STEP4:SOUNDI,1
:NEXTI:GOTO63
74 REM MARATHON FROM afabear sof
tware BY JOHN FRAYSSE COPYRIGHT
1983
```

command to do almost anything a *LINE* command can do plus much more? Specifically, I am talking about using a *DRAW* to connect points *not* in the L-R-U-D-E-F-H-G directions. Simply use the "M" with no "B" in front of it.

EXAMPLE:

```
10 PMODE3:PCLS:SCREEN1,1,:DRAW"BM100,100
   C2M120,100"
20 GOTO20
```

Now, you could replace the *DRAW* with a *LINE* command but in terms of line color you only have a choice of *PSET* or *PRESET*. To get the right color, you would also need a *COLOR* command. The *DRAW* does not need a *COLOR* command plus it has the L-R-U-D-E-F-H-G directional capability as well as color, scale and the ability to execute *STRINGS*. *DRAW* also takes less space than *LINE* giving you more graphics in the same memory. *LINES* are only more convenient when the points you are connecting are variables, but you can still make a *DRAW* work by converting the variable coordinates to strings and inserting them into the *DRAW* syntax.

Now, what is the "1 to 2" rule? That's my name, incidentally, for lack of a better one. It will allow you to make substantially better looking multi-color, hi-res graphics. If you wish to outline an object and paint it in hi-res *(PMODE4)* you must first switch to *PMODE3* then *DRAW, PAINT* and switch back to *PMODE4*. Have you ever noticed that the edges of some of your figures look better than others? The smooth edges are because of the "1 to 2" rule or when the slope of a line is ±½.

EXAMPLE:

```
10 PMODE3: PCLS: SCREEN1,1,: DRAW"BM100,100
   C2M120,110L20U1): PAINT (104,106),2,2: PMODE4,
   1: SCREEN1,1
20 GOTO20
```

See that nice upper right edge? That's because (110-100)/(120-100)=10/20=.5. Now, let's try a triangle with a 45 degree angle. Change the *DRAW* to DRAW"BM100, 100CF20L20U20" then *RUN*. Note how ragged the edge looks? This is due to the fact that the orange and blue colors of *PMODE4* are caused by vertical lines drawn every other X position. If this pattern starts on an odd numbered X position, the color will be either orange or blue; if on an even numbered position the color will be the opposite (orange or blue) of what it was when the pattern started on the odd numbered position. Using lines with .5 slopes fits perfectly into the "every other line" color pattern, hence the smooth edges. Use of this technique is evident in the "FLY" trial graphics (mountains) although it could not be used everywhere because I needed to have the mountains steeper in places.

Count the colors in *Marathon* . . . 5, 6, *7*? Right! How? Well, orange-yellow stripe patterns can be obtained by drawing PSET lines every third or more X positions, but starting one position over from the beginning line of the exiting orange color pattern.

EXAMPLE:

```
10 PMODE4,1: PCLS: SCREEN1,1: FORI=20 TO 60
   STEP2: LINE(I,10)-(I,60),PSET: NEXTI: FOR I=20
   TO 60 STEP 3: LINE(I+1,10)-(I+1,60),PSET: NEXTI
20 GOTO20
```

The two colors of the balloon in the "FLY" scene are neither orange nor blue; they are purple and red. These are caused by alternating orange and blue horizontal lines one

over top of the other.

So, now you should see black, white, blue, orange, yellow, purple and red—*seven colors!*

Machine Language Subroutines

Let me first address those of you who are still confused over the marriage of BASIC and ML. If you are confused, it is probably because you think that you have to have an editor/assembler/monitor (EAM) to do ML. For all practical purposes, this is so if *you* are developing the ML. However, if someone else does that for you and puts the ML in a form that BASIC can handle, then you do *not* need an EAM, only a BASIC program containing the ML code. This is precisely what lines 30—35 are. Line 30 is a loop, reading the ML code values in the *DATA* statements (lines 31—35) one at a time and *POKEing* these values into a particular portion of memory. The values in the *DATA* statements are the results of assembling the assembly listing given in this article. The CoCo's 6809 microprocessor understands these numbers and the sequence they are in, whether they came directly from an assembler or through a BASIC program such as *Marathon*. Inserting the ML in decimal form into a BASIC program via *DATA* statements is the most straightforward way of providing those of you without EAMs all the benefits of ML without ever taking your eyes off the listing or your fingers from the keyboard. Well, now, I hope that settles this issue! Press on!

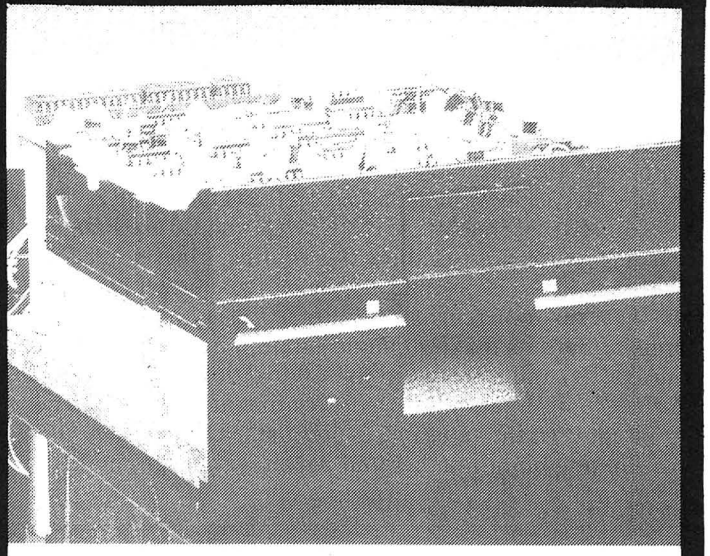
You will notice that I have assembled all five ML routines together; however, each routine has its own RTS (return to BASIC). So, all I need to do is determine where the start addresses are for each routine and jump to them from BASIC whenever I want one. This can be done in two ways; through

> *"This small savings is in the most repeated loop, so a little bit of time savings here gets multiplied by the number of times the loop is executed."*

the *DEFUSR/USR* method or the *EXEC*A (where "A" is the starting address) method. I choose to use the *DEFUSR/USR* method with the first routine (joystick sample and limit) because I wanted to pass a coordinate variable back to BASIC. I used the *EXEC*A(T) method on the other four scenery-moving routines because it allows a subscripted variable as its address (A(T)), where A(T) was defined as the starting address of the Tth trial (T=1 to 4).

Note that the assembly listing is PIC (position independent code) due to the use of the PCR mnemonic following references to memory reserved labels (HRZ, LMIN, LMAX, C0). PIC means that you can move the ML code anywhere in memory and it will work just fine. This made converting the location of the ML for the 16K version of *Marathon* a snap! If I define the start address of the first ML subroutine as the variable "AD," and the start addresses of the other four ML routines relative to AD, then relocation is as simple as redefining AD. You will find the definition of AD in line 0 and the definition of the other four ML starting addresses (A(1—4)) in line 47. Note in the 16K instructions that AD=16075 and I have added a *CLEAR360,16074* state-

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ment. This *CLEAR* statement clears 360 bytes of string memory space and sets the top of BASIC at 16074 so that the ML can be loaded safely starting at AD (16075 through 16375).

* From now on, the references to line numbers will refer to assembly listing line numbers unless otherwise stated.

ML Routine #1

This routine uses the four reserved memory locations at the end of the assembly listing. Line 2 causes a jump to BASIC's joystick to sample, based on the value of HRZ. The value of HRZ as well as LMIN, LMAX and C0 are *POKEd* in from BASIC prior to calling this routine. Lines 8—28 add eight to the joystick sample, divide by 16, subtract two then add the result to the current value of C0. C0 is then limited in terms of both its maximum and minimum values (LMAX and LMIN) and restored in the C0 location. Lines 29—30 cause a jump to another BASIC routine at address $B4F4 which converts the value of C0 (now in the D register (A+B)) to a floating point number and passes it through the USR argument list. Line 30 returns to BASIC.

ML Routine #2

This routine moves the SUB scene to the right and wraps the graphics around. The key to this routine is how the screen elements are moved two bits at a time. Each byte is eight bits; therefore, the bytes must be sliced up and pushed around such that every two-bit pair "walks" to the right on the screen within the limits of the animation block. Here's how it's done.

Line 31 loads X with the hex address of the end byte on the first row to be moved. Since each row is 16 bytes long, line 32 loads B with $1F (15) as it will be used as a counter which, when zero, will signal the end of a row. Lines 33—37 load A with the byte pointed to by the X register and does a RORA three times and masks off the lower order bits. Or put another way, the last two bits in the byte at address X have been moved to the first bits in the byte followed by six zeros. Line 38 pushes this result onto the stack for safekeeping until all the bits in the row have been moved. This is the "wrap-around" byte. Lines 39—41 load the X address byte into A and LSRA's twice, thereby dropping off the last two bits and pulling zeros into the first two. Line 42 pushes this result onto the stack for temporary storage. Now line 43 loads A with the X-1 byte or the byte to the left of the one previously operated on. Lines 44—46 do a RORA three times moving the last two bits in A into the first two while line 47 masks off the last six bits. Lines 48—49 *OR* the contents of A with the last byte pushed onto the stack (at line 42) and stores it at the X address.

At this point, the X byte has the two LSBs of the X-1 byte as its two MSBs. Or, a two-bit pair has moved two bits to the right! Lines 50—52 decrement X and B and performs the entire process over until B is zero, at which time you have worked your way to the end of the row and are ready to do the wrap. Lines 53—57 load the X byte (now the end byte in the row), shifts the two LSBs out, pulling two zeros into the two MSBs and *ORs* the result with the value on the stack. The stack value at this point is none other than the "wrap-around" byte placed there in line 38. This is subsequently stored in the X position. So then, the two LSBs of the end byte of the row have become the two MSBs of the byte at the beginning of the row. A two-bit wrap-around!

Now, you need to repeat this for all the rows and to start back at the end of the next row down. Let's see, 32 bytes per row and we decremented B to zero starting from 15 (32+15=47), line 58 adds 47 to the X pointer to start us back at the end of the next row while lines 59—60 check to see if we have finished all the rows. If not, we "do" to the next row (LOOP1); if so we return to BASIC.

ML Routine #3

Routine #3 is very similar to #2 except it moves the (FLY) scenery to the left. You will notice that the RORA and LSRA commands in #2 have turned into ROLA and LSLA and that the bit mask 11000000 is now 00000011.

ML Routine #4

Now, let's see about doing this two-bit business with vertical—(up/SLED) animation. The scene is seven bytes wide so lines 92—93 load X with the leftmost byte of the first row to be moved and B is loaded with the number of bytes per row (seven). Once again B=0 will flag us that we are at the end of the row. Lines 94—100 push two lines (14 bytes) one byte at a time onto the stack for safekeeping; the equivalent of a *GET*(8,8)-(63-9),xx,G command. Lines 101—

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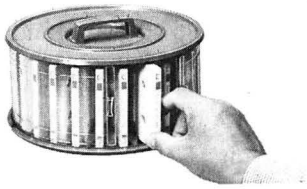
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109 perform a two-line move up on every byte in the SLED scene. Note the offset to the X register in the STA command in line 104. To move up two lines, we should subtract 32*2=64 *not* 65! But note the auto-increment on X in the line above (line 103). The X+ saves us from an additional INX or LEAX 1,X statement, so we must subtract one more (-64-1= -65) This small savings is in the most repeated loop, so a little bit of time savings here gets multiplied by the number of times the loop is executed.

Now let's complete the wrap-around. Lines 110—119 do the exact opposite as lines 92—100 and are the same thing as a *PUT*(8,182)-(63,183),xx,PSET. The only difference is that the address loaded into X is now the address of the end byte on the last row at the bottom of the scene.

ML Routine #5

This is the downward (AUTO) scenery move routine. The differences between lines 92—119 and lines 120—147 are almost non-existent, save the obvious difference in the X register's load address which is across the graphics page.

Some of you sharp folks out there might be saying, hey, he could have used the double accumulator (A+B) to move the vertical scenes if he had just made the scenes an even number of bytes wide, say six or eight. Well, you are right! But, there are two good reasons not to. The first is that a six-byte SLED or AUTO scene appeared to be too narrow and an eight-byte wide scene made the SUB and FLY scenes too short. The second reason is that the four ML routines execute almost precisely at the same speed in their respective animation loops. This meant that I didn't have to worry about "padding" the ML or the BASIC.

Well, what can I say besides that I'm getting writer's cramp?! Feel free to "pull my chain" if you still have problems after reading everything here and giving it a good try.

As always, I am very interested in your success and will make every effort to help you out. But for now I think I will close and take the wife and kids on a long weekend sail along our beloved Chesapeake—land of bounteous grace! Until next time, may peace be your companion.

Your CoCo Friend,
John

```
                        *     THIS ROUTINE SAMPLES
                        *     THE RIGHT JOYSTICK
                        *     AND PASSES A
                        *     COORDINATE VALUE(C0)
                        *     THROUGH BASIC'S USR

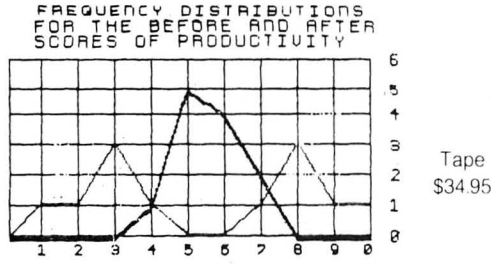
0001 0600                     ORG 24000       32K START PIC
0002 5DC0 AD9FA00A            JSR [$A00A]     BASIC JYSTK
0003 5DC4 E68D0125            LDB HRZ,PCR     LD HRZ
0004 5DC8 2705                BEQ HORIZ       TEST IF 0/1
0005 5DCA F6015B              LDB $15B        LD VERT JSTK
0006 5DCD 2003                BRA CONT        GO AROUND
0007 5DCF F6015A      HORIZ   LDB $15A        LD HORZ JSTK
0008 5DD2 CB08        CONT    ADDB #8         ADD 8 TO JSTK
0009 5DD4 54                  LSRB            DIV
0010 5DD5 54                  LSRB
0011 5DD6 54                  LSRB            BY
0012 5DD7 54                  LSRB            16
0013 5DD8 C002                SUBB #2         -2-->+/-RATE
0014 5DDA EB8D0112            ADDB C0,PCR     ADD TO C0
0015 5DDE E18D010C            CMPB LMIN,PCR   LMIN TEST
0016 5DE2 250D                BLO LIML
0017 5DE4 E18D0107            CMPB LMAX,PCR   LMAX TEST
0018 5DE8 2212                BHI LIMH
0019 5DEA E78D0102            STB C0,PCR      RE-STR C0
0020 5DEE 4F                  CLRA            A=0
0021 5DEF 2014                BRA HOME        EXIT ML RTE
0022 5DF1 E68D00F9    LIML    LDB LMIN,PCR    C0=LIMN
0023 5DF5 E78D00F7            STB C0,PCR      RE-STR C0
0024 5DF9 4F                  CLRA            A=0
0025 5DFA 2009                BRA HOME        EXIT ML RTE
0026 5DFC E68D00EF    LIMH    LDB LMAX,PCR    C0=LMAX
0027 5E00 E78D00EC            STB C0,PCR      RE-STR C0
0028 5E04 4F                  CLRA            A=0
0029 5E05 BDB4F4      HOME    JSR $B4F4       BASIC ROM
0030 5E08 39                  RTS             RTE/RETURN

                        *      THIS ROUNTINE MOVES THE
                        *      SUB TRIAL SCENERY
                        *      2 BITS AT A TIME TO THE
                        *      RIGHT AND WRAPS THE
                        *      SCENE AROUND

0031 5E09 8E0757              LDX #$757       UPPER LT BYTE
0032 5E0C C60F        LOOP1   LDB #$0F        SCENE WIDTH-1
0033 5E0E A684                LDA ,X          LD END BYTE
```


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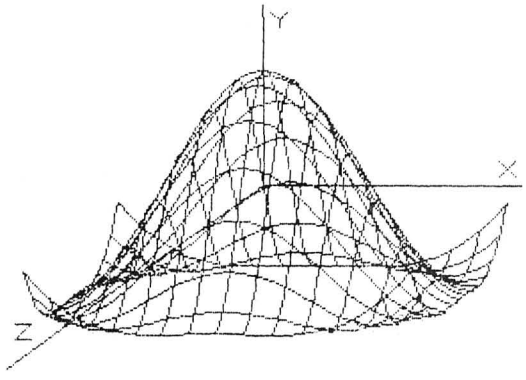
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```
0034 5E1F 46            RORA            MOVE 2 END
0035 5E11 46            RORA            BITS TO FIRST
0036 5E12 46            RORA            TWO BITS
0037 5E13 84C0          ANDA #%11000000  6 BIT MSK
0038 5E15 3402          PSHS A          STR WRAP BYTE
0039 5E17 A684    LOOP2 LDA ,X          LD END BYTE
0040 5E19 44            LSRA            SHIFT LAST 2
0041 5E1A 44            LSRA            BITS OUT
0042 5E1B 3402          PSHS A          STR ON STACK
0043 5E1D A61F          LDA -1,X        GET BYTE @ LT
0044 5E1F 46            RORA            MOVE LAST 2
0045 5E20 46            RORA            BITS TO THE
0046 5E21 46            RORA            FIRST 2
0047 5E22 84C0          ANDA #%11000000  6 BIT MSK
0048 5E24 AAE0          ORA ,S+         OR WITH STACK
0049 5E26 A784          STA ,X          STR AT X POS.
0050 5E28 301F          DEX             DECREASE X
0051 5E2A 5A            DECB            DECREASE B
0052 5E2B 26EA          BNE LOOP2       B=0?/END ROW?
0053 5E2D A684          LDA ,X          LD FIRST BYTE
0054 5E2F 44            LSRA            SHIFT LAST 2
0055 5E30 44            LSRA            BITS OUT
0056 5E31 AAE0          ORA ,S+         OR WITH WRAP
0057 5E33 A784          STA ,X          STR RESULT@X
0058 5E35 308B2F        LEAX $2F,X      END NEXT ROW
0059 5E38 8C0E37        CMPX #$E37      DONE W/ROWS?
0060 5E3B 2FCF          BLE LOOP1       DO TIL TRUE
0061 5E3D 39            RTS             RTS TO BASIC

                *       THIS ROUTINE MOVES THE
                *       FLY SCENE TO THE LEFT
                *       2 BITS AT A TIME AND
                *       WRAPS THE SCENE AROUND

0062 5E3E 8E15E8        LDX #$15E8      UP/RT BYTE
0063 5E41 C60F    LOOP3 LDB #$0F        SCENE WIDTH-1
0064 5E43 A684          LDA ,X          LD BYTE
0065 5E45 49            ROLA            MOVE FIRST 2
0066 5E46 49            ROLA            BITS TO LAST
0067 5E47 49            ROLA            2 BITS
0068 5E48 8403          ANDA #%00000011  6 BIT MSK
0069 5E4A 3402          PSHS A          STR WRAP BYTE
0070 5E4C A684    LOOP4 LDA ,X          LD BYTE
0071 5E4E 48            LSLA            SHIFT FIRST 2
0072 5E4F 48            LSLA            BITS OUT
0073 5E50 3402          PSHS A          STR ON STACK
0074 5E52 A601          LDA 1,X         GET BYTE TO RT
0075 5E54 49            ROLA            MOVE FIRST 2
0076 5E55 49            ROLA            BITS TO THE
0077 5E56 49            ROLA            LAST 2 BITS
0078 5E57 8403          ANDA #%00000011  6 BIT MSK
0079 5E59 AAE0          ORA ,S+         OR WITH STACK
0080 5E5B A780          STA ,X+         STR @ X/INC X
0081 5E5D 5A            DECB            DECREMENT B
```


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```
0082 5E5E 26EC          BNE LOOP4       B=0?/END ROW?
0083 5E60 A684          LDA ,X          GET X BYTE
0084 5E62 48            LSLA            SHIFT FIRST 2
0085 5E63 48            LSLA            BITS OUT
0086 5E64 AAE0          ORA ,S+         OR W/WRAP BYTE
0087 5E66 A784          STA ,X          STR RESULT @ X
0088 5E68 308811        LEAX $11,X      BEGIN NEXT ROW
0089 5E6B 8C1D28        CMPX #$1D28     DONE W/ROWS?
0090 5E6E 26D1          BNE LOOP3       DO TIL TRUE
0091 5E70 39            RTS             RTS TO BASIC

                *       THIS ROUTINE MOVES THE
                *       SLED SCENERY UPWARD AND
                *       AND WRAPS IT AROUND

0092 5E71 8E0701        LDX #$701       *THIS BLOCK OF
0093 5E74 C607    LOOP5 LDB #7          CODE IS THE
0094 5E76 A680    LOOP6 LDA ,X+         EQUILAVANT
0095 5E78 3402          PSHS A          OF A
0096 5E7A 5A            DECB            GET(8,8)-(63,9
0097 5E7B 26F9          BNE LOOP6       ),XX,G
0098 5E7D 308819        LEAX 25,X
0099 5E80 8C0741        CMPX #$741      DONE W/ROWS?
0100 5E83 26EF          BNE LOOP5       DO TIL TRUE*

0101 5E85 8E0741        LDX #$741       STRT ADR ROW12
0102 5E88 C607    LOOP7 LDB #7          SCENE WIDTH-1
0103 5E8A A680    LOOP8 LDA ,X+         LD BYTE
0104 5E8C A788BF        STA -65,X       MOVE UP 2 ROWS
0105 5E8F 5A            DECB            B=B-1
0106 5E90 26F8          BNE LOOP8       B=0?/END ROW?
0107 5E92 308819        LEAX 25,X       PT TO NEXT ROW
0108 5E95 8C1D01        CMPX #$1D01     DONE W/ROWS?
0109 5E98 26EE          BNE LOOP7       DO TIL TRUE

0110 5E9A 8E1CE8        LDX #$1CE8      *THIS BLOCK OF
0111 5E9D C607    LOOP9 LDB #7          CODE IS THE
0112 5E9F 3502    LOOP10 PULS A         EQUILAVANT
0113 5EA1 A782          STA ,-X         OF A
0114 5EA3 5A            DECB            PUT(8,182)-
0115 5EA4 26F9          BNE LOOP10      (63,183),XX,
0116 5EA6 3088E7        LEAX -25,X      PSET
0117 5EA9 8C1CA8        CMPX #$1CA8     DONE W/ROWS?
0118 5EAC 26EF          BNE LOOP9       DO TIL TRUE
0119 5EAE 39            RTS             RTE TO BASIC*

                *       THIS ROUTINE MOVES AUTO
                *       SCENERY DOWNWARD AND
                *       WRAPS IT AROUND

0120 5EAF 8E1CF8        LDX #$1CF8      *THIS BLOCK OF
0121 5EB2 C607    LOOP11 LDB #7         CODE IS THE
0122 5EB4 A680    LOOP12 LDA ,X+        EQUILAVANT
0123 5EB6 3402          PSHS A          OF A
0124 5EB8 5A            DECB            GET(192,182)-
0125 5EB9 26F9          BNE LOOP12      (247,183),XX,
0126 5EBB 3088D9        LEAX -39,X      PSET
0127 5EBE 8C1CB8        CMPX #$1CB8     DONE W/ROWS?
0128 5EC1 26EF          BNE LOOP11      DO TIL TRUE*

0129 5EC3 8E1CB8        LDX #$1CB8      BYTE ON ROW181
0130 5EC6 C607    LOOP13 LDB #7         SCENE WIDTH-1
0131 5EC8 A680    LOOP14 LDA ,X+        LD BYTE/INX
0132 5ECA A7883F        STA 63,X        MOVE DN 2 ROWS
0133 5ECD 5A            DECB            B=B-1
0134 5ECE 26F8          BNE LOOP14      B=0?/END ROW?
0135 5ED0 3088D9        LEAX -39,X      ADR NEXT ROW
0136 5ED3 8C06F8        CMPX #$6F8      DONE W/ROWS?
0137 5ED6 26EE          BNE LOOP13      DO TIL TRUE

0138 5ED8 8E071F        LDX #$71F       *THIS BLOCK OF
0139 5EDB C607    LOOP15 LDB #7         CODE IS THE
0140 5EDD 3502    LOOP16 PULS A         EQUILAVANT
0141 5EDF A782          STA ,-X         OF A
0142 5EE1 5A            DECB            PUT(192,8)-
0143 5EE2 26F9          BNE LOOP16      (247,9),XX,
0144 5EE4 308827        LEAX 39,X       PSET
0145 5EE7 8C075F        CMPX #$75F      DONE W/ROWS?
0146 5EEA 26EF          BNE LOOP15      DO TIL TRUE
0147 5EEC 39            RTS             RTE TO BASIC

0148 5EED         HRZ   RMB 1           HOR/VERT TRIAL 0/1
0149 5EEE         LMIN  RMB 1           MIN LIMIT OF C0
0150 5EEF         LMAX  RMB 1           MAX LIMIT OF C0
0151 5EF0         C0    RMB 1           OUTPUT COORDINATE
0152 5EF1               END
```


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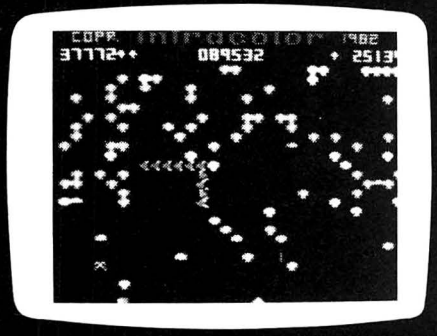
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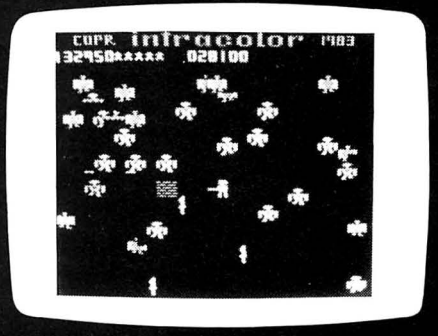
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HIDE THAT DISK DIRECTORY

By Harry Hardy

How many times have you entered in a long program or text file, typed *SAVE*"filename" and the next prompt you got was "?I/O ERROR"? If that's not enough, you then type DIR only to discover that your directory isn't there anymore. Frustrating, isn't it? Even just one occurrence is too many.

What if we could hide a copy of that directory some place that even BASIC couldn't find? That is an interesting idea, but how can we do that? Well, not too long ago I discovered that my Radio Shack drive has the mechanical ability to access track 36. Actually that would be track 35 in the numbering scheme. Remember the other 35 tracks are numbered 0—34. Well, I got an idea; if I can actually access track 36, why not put a copy of the directory track, 17, out there?

If you have the 64K modification on your Color Computer that task is really quite simple, but if you don't have the mod you will need a program to do this for you. I have included the listings of several programs that will accomplish this. Two listings are in machine language for those of you with an editor/assembler, two are in BASIC with appropriate *DATA* statements to generate the two machine language programs, and the last one can be used to destroy your directory once you are satisfied that either set of the first two are working.

Before I explain how these programs work, let's see if we can get an idea of why the directory track seems to be the one most often destroyed. Remember our tracks are numbered 0—34 with track 17, the directory track, being right in the middle. Not only are the directory entries there, but so is something else called the *File Allocation Table.* Now when you want to access a file or save one, BASIC uses the file allocation table to locate the various granules associated with that file. Remember, each granule is half a track or nine sectors. Since the disk head moves across track 17 so much to access this table, chances are very good, unfortunately, that if some type of error is going to occur it will happen on the directory track. That's why a backup of each disk is advisable. However, with the programs I've included, you will be able to restore that *crashed* directory, assuming that the surface of the disk was not damaged.

"... not too long ago I discovered that my Radio Shack disk drive has the mechanical ability to access **track 36."**

The first program I have included is called *INIT36* for initialize track 36. Getting this track initialized is the first thing you will have to do. This program assures three things. The first being that the other tracks have already been initialized by using the DSKINI command. If they have not been initialized then you will get an I/O error from this program. I further assume that when you do the DSKINI that you use the default skip factor. If not, then it will be up to you to change the SKPTBL as appropriate. The other assumption is that drive 0 contains the disk we want to use. If you want to use another drive, I coded the program so it can be changed by *POKEing* the drive number in memory. Once you have loaded the program into memory type POKE &H1018,&Hn, where n is the drive number (0—3)

(Harry Hardy, who has 15 years experience as an applications and systems programmer in telecommunications is currently employed as a telecommunications consultant by a large company that provides data communications products and services.)

that you want to use. I do not validate drive number so if you type in a number for a nonexisting drive, the machine will lock up and you will have to push the reset button. The program is completely relocatable but be aware that since it formats all 18 sectors at the same time, it will require about 6400 bytes of *RAM* to run in. So don't try to load it with an offset too high into *RAM*.

Here is how this program works. At the routine labeled START, I display a prompt and read track 34 sector 18. I do this simply to get the head moved to the last valid sector that BASIC knows. If the disk was not initialized by using DSKINI you will get an I/O error here. The next routine labeled STEP is used to cause the 1793 to step the head to track 36. Remember 36 is really 35. Any place in the program that indicates 36 in the comment is done for easier understanding of the listing. I will refer to this track as 36 throughout the remainder of this article.

Once we have moved the head to track 36, I then format the 18 sectors. This is done starting at statement 54. The sectors are formatted according to the *Disk Programmers Manual* on page 58. Once all sectors are formatted, they must be given to the 1793. This is done at the routine labeled WRITE. This is done by storing each character on the data register for the 1793. Look at that routine for a minute.

The first instruction loads the address of the data register in the Y register. We then disable both interrupts. After that the old interrupt vector and vector out indicator are stored on the stack. The next instruction then loads the address of a routine within our program that control is to be given too, after all the data is written to the disk by the 1793. This address is then stored at location 0983. We now tell the 1793 that we want to write a track of data. This is done by storing the proper command on the command register located at address FF48. The command to write a track is *$F4*. Next, we must enable the NMI indicator for the 1793. This is done by storing a value on the control register located at FF40. A copy of that image is maintained at location 0986. By loading that address in the A register and turning on bit 7, we enable the NMI for the 1793 once the new value is stored on the control register.

The routine labeled W1793 simply gets a character from our formatted buffer and stores it on the data register. We will stay in that loop until all the data is sent. Once the 1793 has written all 18 sectors, it will interrupt the 6809 and give control back to us at the routine labeled RETURN. Remember, we saved the address of this routine in statements 100 and 101. This routine restores the old vector address, then gets the status byte from the 1793. I mask off drive not ready and busy bits before testing for an error. This routine then reads the new track to verify that it was written successfully, if not then an I/O error is issued here. Finally, I clear the screen and do a cold start back to Disk BASIC.

Now that we have a disk with 36 initialized tracks, how can we get our directory there? That's the job of the second program that I've called *HIDEDIR* for hide directory. This program simply gives you the option of saving or restoring the directory. If you want to save it, it reads all of track 17 and writes it to our newly initialized track; to restore the directory this program does just the opposite. Again, this program also assumes that drive 0 contains the drive we are to hide the directory on. If you want to use another drive, *POKE* that drive number in &H10004. Like the other program, I do not validate drive number.

Want to test it out? Type in the first two programs using your assembler and/or editor. Once you get an error free listing verify that it matches my listing and run each one, *INIT36* first then *HIDEDIR*. Next type and run the short BASIC program I've called *Crash Directory*. After you run this program type DIR. How about that—you now have restored that lost directory! I do suggest that you try this a few times on a copy of an old disk until you are satisfied that it works. If you are having problems, verify your listings with mine.

If you're using the BASIC programs to generate these programs, be sure to carefully check that your *DATA* statements match the listing. I have included instructions on how to save the programs in each BASIC listing.

One note here. Once you are satisfied these programs are working and you hide your directory, then any copies you make of your disk, you will have to run the programs to hide your directories on the backups. BASIC will not backup that track for you.

". . . you can also use the above method to access all 40 tracks. Just add four to each ***POKE*** *value and put whatever you wish on these extra five tracks."*

Now what about those of you who have the 64K mod on your Color Computer? Well, after you run whatever program you have to get an all *RAM* system, the following *POKEs* will allow you to use the BASIC commands to initialize track 36, make use of the DSKO$ and DSKI$, and to do a backup command. First, POKE &HD572,&H24 and &HD595,&H24. These two will allow DSKINI to initialize 36 tracks. POKE &HD446,&H23 POKE &HD1B0,&H24 will allow DSKI$ DSKO$ and backup to access track 36. I did not make a typing error on the &H23, DSKI$ and DSKO$; use 23 instead of 24 for track number comparisons.

Should you not have a Radio Shack drive that has 40 tracks, you can also use the above method to access all 40 tracks. Just add four to each *POKE* value and put whatever data you wish on these extra five tracks. Remember, however, that BASIC will not use these tracks for file allocation since its file allocation method is based on 35 tracks. So, if you make use of the extra disk space you will have to manage it yourself.

I hope you don't have to use the *HIDEDIR* program to restore any directories, but if you do, I hope you find it useful.

Listing 1:

```
INIT36                          COMPUTERWARE MACRO ASSEMBLER
INITIALIZE TRACK 36 ON RADIO SHACK DRIVE


                0001        NAM   INIT36
1000            0002        ORG   $1000
                0003        OPT   NOG

                0005 * THIS PROGRAM CAN BE USED TO INITALIZE TRACK 36 ON A
                0006 * RADIO SHACK DRIVE. TRACK 36 IS UNUSED BY COLOR BASIC
                0007 * THEREFOR IT IS A PERFECT PLACE TO HIDE A COPY OF
                0008 * YOUR DIRECTORY.
```

```
                        0009 *
                        0010 * WRITTEN BY HARRY HARDY 1983

1000 BDA928     0012 START  JSR   $A928       GO CLEAR SCREEN
1003 308D0133   0013        LEAX  PROMPT,PCR
1007 2003       0014        BRA   DISPLA      DISPLAY PROMPT
1009 BDA282     0015 D1     JSR   $A282       DISPLAY CHAR IN A REG.
100C A680       0016 DISPLA LDA   ,X+         GET PROMPT CHARACTER
100E 26F9       0017        BNE   D1          NOT DONE GO DISPLAY CHAR.
1010 BDA1B1     0018 GETR   JSR   $A1B1       GO GET REPLY
1013 810D       0019        CMPA  #$D         ENTER KEY
1015 26F9       0020        BNE   GETR        NO GET AGAIN
1017 8600       0021        LDA   #0          SET DRIVE NUMBER
1019 97EB       0022        STA   $EB         TO DRIVE 0
101B 8602       0023        LDA   #$02        SET OPCODE FOR READ
101D 97EA       0024        STA   $EA         SAVE FOR DSKCON
101F 8622       0025        LDA   #34         SET TRACK FOR TRACK 34
1021 97EC       0026        STA   $EC         SAVE FOR DSKCON
1023 8612       0027        LDA   #18         SET SECTOR FOR SECTOR 18
1025 97ED       0028        STA   $ED         SAVE FOR DSKCON
1027 308D017A   0029        LEAX  BUFFER,PCR  GET I/O BUFFER ADDR
102B 9FEE       0030        STX   $EE         SAVE FOR DSKCON
102D BDD66C     0031        JSR   $D66C       GO READ TRACK 34 SECTOR 18
1030 0DF0       0032        TST   $F0         ANY ERRORS
1032 2705       0033        BEQ   STEP        NO GO STEP TO NEXT TRACK
1034 C628       0034 IOERR  LDB   #$28        SET I/O ERROR CODE
1036 7EAC46     0035        JMP   $AC46       GO TO BASIC ERROR ROUTINE

                        0037 * THIS ROUTINE STEPS THE HEAD TO TRACK 36

1039 B60986     0039 STEP   LDA   $0986       GET FF40 IMAGE
103C 8A10       0040        ORA   #$10        ENABLE WRITE PRECOMPENSATION
103E B7FF40     0041        STA   $FF40       GIVE TO 1793
1041 8653       0042        LDA   #$53        GET STEP IN COMMAND
1043 B7FF48     0043        STA   $FF48       GIVE TO 1793
1046 1E88       0044        EXG   A,A         DELAY
1048 1E88       0045        EXG   A,A         DELAY SOME MORE
104A BDD6DE     0046        JSR   $D6DE       GO WAIT FOR 1793 TO BECOME UNBUSY
104D 26E5       0047        BNE   IOERR       IF NEVER UNBUSY GO TO ERROR
104F BDD6FD     0048        JSR   $D6FD       GO DELAY AWHILE

                        0050 * THIS ROUTINE FORMATS THE 18 SECTORS FOR TRACK 36
                        0051 * EACH SECTOR IS FORMATTED AS DEFINED IN
                        0052 * THE DISK PROGRAMMERS GUIDE

1052 0CEC       0054        INC   $EC         TRACK NOW EQUALS 36
1054 308D014D   0055        LEAX  BUFFER,PCR  GET BUFFER ADDR
1058 CC204E     0056        LDD   #$204E      SET COUNT AND CHARACTER
105B BD2F       0057        BSR   PUTCH       GO LOAD BUFFER WITH CHARACTER
105D 5F         0058        CLRB              CLEAR SECTOR COUNTER

105E 3404       0059 NEXT   PSHS  B           SAVE COUNTER ON STACK
1060 338D00AC   0060        LEAU  SKPTBL,PCR  GET SKIP TABLE ADDR.
1064 E6C5       0061        LDB   B,U         LOAD SECTOR NUMBER FROM TABLE
1066 D7ED       0062        STB   $ED         SAVE IT
1068 338D00B6   0063        LEAU  SYSCNT,PCR  SECTOR SYSTEM CONTROL CHARACTERS
106C 8603       0064        LDA   #3          LOAD 3 FOR FIRST THREE FIELDS
106E BD22       0065        BSR   LDBUFF      GO MOVE TO BUFFER
1070 96EC       0066        LDA   $EC         GET TRACK #
1072 A780       0067        STA   ,X+         STORE IN BUFFER
1074 6F80       0068        CLR   ,X+         CLEAR NEXT SYSTEM FIELD
1076 96ED       0069        LDA   $ED         GET SECTOR #
1078 A780       0070        STA   ,X+         STORE IN BUFFER
107A 8609       0071        LDA   #9          LOAD BUFFER WITH NEXT NINE
107C BD14       0072        BSR   LDBUFF      SYSTEM FIELDS
107E 3504       0073        PULS  B           GET SECTOR COUNT
1080 5C         0074        INCB              ADD 1 TO COUNTER
1081 C112       0075        CMPB  #18         HAVE WE DONE 18 YET
1083 25D9       0076        BLO   NEXT        NO DO ANOTHER ONE
1085 CCC84E     0077        LDD   #$C84E      DONE
1088 BD02       0078        BSR   PUTCH       GIVE 1793 LAST FIELDS
108A 2012       0079        BRA   WRITE       GO WRITE ALL TO 1793
108C E780       0080 PUTCH  STB   ,X+          PUT CHARACTER IN BUFFER
108E 4A         0081        DECA              SUB 1 FROM COUNT
108F 26FB       0082        BNE   PUTCH       NOT DONE MOVE NEXT ONE
1091 39         0083        RTS               DONE RETURN TO CALLER
1092 3402       0084 LDBUFF PSHS  A           SAVE # OF FIELDS TO MOVE
1094 ECC1       0085        LDD   ,U++        GET SYSTEM FIELD TO MOVE
1096 BDF4       0086        BSR   PUTCH       GO MOVE IT TO BUFFER
1098 3502       0087        PULS  A           GET COUNT
109A 4A         0088        DECA              SUB 1 FROM IT
109B 26F5       0089        BNE   LDBUFF      NOT DONE, DO NEXT FIELD
109D 39         0090        RTS               DONE RETURN TO CALLER

                        0092 * THIS ROUTINE GIVES THE 18 FORMATTED SECTORS
                        0093 * TO THE 1793

109E 108EFF4B   0095 WRITE  LDY   #$FF4B      LOAD Y WITH DATA REGISTER
10A2 1A50       0096        ORCC  #$50        DISABLE IRQ AND FIRQ
10A4 BE0983     0097        LDX   $0983       GET OLD VECTOR ADDR
10A7 B60982     0098        LDA   $0982       AND VECTOR OUT IND.
10AA 3412       0099        PSHS  X,A         SAVE ON STACK
10AC 308D0020   0100        LEAX  RETURN,PCR  GET RETURN ADDR. FOR 1793
10B0 BF0983     0101        STX   $0983       SAVE IT IN NMI VECTOR
10B3 308D00EE   0102        LEAX  BUFFER,PCR  GET BUFFER ADDRESS
10B7 B6FF48     0103        LDA   $FF48       RESET FLAG
10BA 730982     0104        COM   $0982       ENABLE NMI VECTOR OUT
10BD 86F4       0105        LDA   #$F4        1793 COMMAND TO WRITE TRACK
10BF B7FF48     0106        STA   $FF48       SAVE ON COMMAND REGISTER
10C2 B60986     0107        LDA   $0986       GET RAM IMAGE OF FF40
10C5 8A80       0108        ORA   #$80        ENABLE NMI FOR 1793
10C7 B7FF40     0109        STA   $FF40       PUT ON CONTROL REGISTER
10CA A680       0110 W1793  LDA   ,X+         GET CHARACTER FORM BUFFER
10CC A7A4       0111        STA   0,Y         PUT ON DATA REGISTER
10CE 20FA       0112        BRA   W1793       GO PUT NEXT CHAR.

                        0114 * WE WILL STAY IN THIS W1793 LOOP UNTIL THE 1793
                        0115 * HAS WRITTEN ALL DATA TO DISK. AFTERWARDS THE 1793
                        0116 * WILL TRANSFER CONTROL TO THE ROUTINE BELOW

10D0 3512       0118 RETURN PULS  X,A         GET OLD VECTOR ADDR.
10D2 BF0983     0119        STX   $0983       RESTORE IT AND
10D5 B70982     0120        STA   $0982       VECTOR OUT IND.
10D8 B6FF48     0121        LDA   $FF48       GET STATUS
10DB 1CAF       0122        ANDCC #$AF        ENABLE IRQ AND FIRQ
10DD 847C       0123        ANDA  #$7C        MASK OFF NOT READY,&BUSY
10DF 97F0       0124        STA   $F0         SAVE STATUS
10E1 1026FF4F   0125        LBNE  IOERR       ERRORS, GO TO ERROR ROUTINE
```


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```
                    0127 * THIS ROUTINE WILL READ EACH SECTOR TO VERIFY
                    0128 * THAT THEY WERE WRITTEN OK.

10E5 308D00BC       0130        LEAX  BUFFER,PCR  GET I/O BUFFER
10E9 9FEE           0131        STX   $EE         SAVE FOR DSKCON
10EB 8602           0132        LDA   #$02        READ OPCODE
10ED 97EA           0133        STA   $EA         GIVE TO DSKCON
10EF 8623           0134        LDA   #$23        TRACK # 36
10F1 97EC           0135        STA   $EC         SAVE IT
10F3 338D0019       0136        LEAU  SKPTBL,PCR  GET SKIP FACTOR TABLE
10F7 5F             0137        CLRB
10F8 A6C5           0138 READ   LDA   B,U         GET SECTOR TO READ
10FA 97ED           0139        STA   $ED         SAVE IT FOR DSKCON
10FC BDD66C         0140        JSR   $D66C       GO READ SECTOR
10FF 0DF0           0141        TST   $F0         ANY ERRORS
1101 1026FF2F       0142        LBNE  IOERR       YES GO TO ERROR ROUTINE
1105 5C             0143        INCB              ADD 1 TO SECTOR COUNT
1106 C112           0144        CMPB  #18         READ 18 YET
1108 25EE           0145        BLO   READ        NO GO READ NEXT
110A BDA928         0146        JSR   $A928       GO CLEAR SCREEN
110D 7EC000         0147        JMP   $C000       DONE RETURN TO DISK BASIC

                    0149 * ENTRIES FOR SKIP FACTOR. THESE ENTRIES ARE THE
                    0150 * SECTORS TO READ OR WRITE. THEY ARE BASED ON
                    0151 * A SKIP FACTOR OF 4. IF ANOTHER SKIP FACTOR IS
                    0152 * USED WHEN THE FIRST 35 TRACKS ARE INITALIZED THEN
                    0153 * THIS TABLE WILL HAVE TO BE CHANGED OR THE RESULTS
                    0154 * WILL BE UNPREDICTABLE.

1110 01             0156 SKPTBL FCB   1,$0C,5,$10,9,2,$0D,6,$11
1119 0A             0157        FCB   $0A,3,$E,7,$12,$B,4,$F,8


                    0159 * SYSTEM CONTROL FIELDS TO INITALIZE A DISK TRACK
                    0160 * THE FIRST CHARACTER IS THE NUMBER OF CHARACTERS
                    0161 * TO BE OUTPUT. THE NEXT CHARACTER IS THE
                    0162 * CHARACTER TO BE OUTPUTED.

1122 08             0164 SYSCNT FCB   08,00
1124 03             0165        FCB   03,$F5
1126 01             0166        FCB   01,$FE
1128 01             0167        FCB   01,01
112A 01             0168        FCB   01,$F7
112C 16             0169        FCB   $16,$4E
112E 0C             0170        FCB   $0C,00
1130 03             0171        FCB   $03,$F5
1132 01             0172        FCB   01,$FB
1134 00             0173        FCB   00,$FF
1136 01             0174        FCB   01,$F7
1138 18             0175        FCB   $18,$4E

113A 20             0177 PROMPT FCC   /     INITIALIZE TRACK 36/
1153 0D             0178        FCB   $D
1154 20             0179        FCC   /       BY: HARRY HARDY/
1168 0D             0180        FCB   $D,$D
116D 20             0181        FCC   /    INSERT DISK IN DRIVE 0/
1188 0D             0182        FCB   $D,$D
118A 20             0183        FCC   /    HIT ENTER WHEN READY/
11A3 0D             0184        FCB   $D,$0
                    0185        TTL   INITIALIZE TRACK 36 ON RADIO SHACK DRIVE
                    0186 * THE I/O BUFFER STARTS HERE

11A5                0188 BUFFER EQU   *
1000                0189        END   START
        NO ERROR(S) DETECTED
```

Listing 2:

```
                    0001        NAM   HIDE DIRECTORY
                    0002        OPT   NOG
1000                0003        ORG   $1000

                    0005 * THIS PROGRAM WILL READ THE DIRECTORY TRACK (17) AND
                    0006 * SAVE IT ON TRACK 36 WHICH IS NOT USED BY COLOR BASIC
                    0007 * BEFORE THIS PORGRAM CAN RUN TRACK 36 HAS TO BE INITALIZED
                    0008 *
```




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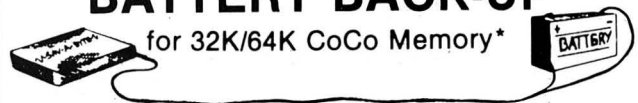
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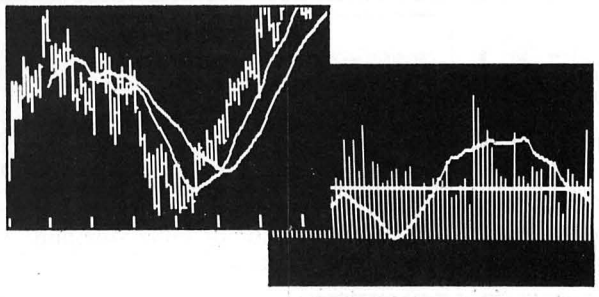
1000 BDA928     0011 BEGIN  JSR   $A928       GO CLEAR SCREEN
1003 8600       0012        LDA   #0          LOAD A WITH 0 TO
1005 97EB       0013        STA   $EB         INITALIZE DRIVE TO 0
1007 8602       0014        LDA   #2          SET OPCODE TO READ
1009 97EA       0015        STA   $EA         FOR DSKCON
100B 8601       0016        LDA   #1          SET START SECTOR TO
100D 97ED       0017        STA   $ED         1 FOR DSKCON.
100F 308D0072   0018        LEAX  MSG,PCR     GET MESSAGE
1013 8D60       0019        BSR   DISPLY      GO DISPLAY IT
1015 8D63       0020        BSR   GETCH       GO GET REPLY
1017 BDA282     0021        JSR   $A282       GO ECHO CHARACTER
101A 8152       0022        CMPA  #'R         RESTORE REQUEST
101C 2706       0023        BEQ   RESTOR      YES GO THERE
101E C611       0024        LDB   #$11        START SAVE AT TRACK 17
1020 D7EC       0025        STB   $EC         SAVE FOR DSKCON
1022 2004       0026        BRA   READ        GO READ IT
1024 C623       0027 RESTOR LDB   #$23        START RESTORE AT TRACK 36
1026 D7EC       0028        STB   $EC         SAVE FOR DSKCON
1028 338D00CA   0029 READ   LEAU  IOBUFF,PCR  GET BUFFER ADDR
102C 5F         0030        CLRB              CLEAR SECTOR COUNTER
102D DFEE       0031 READ1  STU   $EE         SAVE BUFFER ADDR. FOR DSKCON
102F BDD66C     0032        JSR   $D66C       GO READ DISK
1032 0DF0       0033        TST   $F0         ANY ERRORS
1034 264A       0034        BNE   IOERR       YES GO TO ERROR
1036 0CED       0035        INC   $ED         ADJUST SECTOR #
1038 5C         0036        INCB              AND COUNTER
1039 C112       0037        CMPB  #18         ALL BEEN READ YET
103B 2706       0038        BEQ   WRITE       YES GO WRITE THEM
103D 33C90100   0039        LEAU  256,U       NO ADJUST BUFFER POINTER
1041 20EA       0040        BRA   READ1       GO GET NEXT SECTOR
1043 0CEA       0041 WRITE  INC   $EA         SET OPCODE TO WRITE
1045 C601       0042        LDB   #1          SET SECTOR TO 1
1047 D7ED       0043        STB   $ED         SAVE IT
1049 338D00A9   0044        LEAU  IOBUFF,PCR  RESET BUFFER POINTER
104D 8152       0045        CMPA  #'R         IS THIS A RESTORE
104F 2706       0046        BEQ   WRITE1      YES GO THERE

1051 C623       0047        LDB   #$23        NO START SAVE AT TRACK 36
1053 D7EC       0048        STB   $EC         SAVE IT
1055 2004       0049        BRA   WRITE2      GO WRITE DIRECTORY
1057 C611       0050 WRITE1 LDB   #$11        RESTORE STARTS AT TRACK 17
1059 D7EC       0051        STB   $EC         SAVE IT FOR DSKCON
105B 5F         0052 WRITE2 CLRB              CLEAR COUNTER
105C DFEE       0053 WRITE3 STU   $EE         SAVE BUFFER ADDR.
105E BDD66C     0054        JSR   $D66C       GO TO DSKCON
1061 0DF0       0055        TST   $F0         ANY ERRORS
1063 261B       0056        BNE   IOERR       YES GO TO ERROR
1065 0CED       0057        INC   $ED         NO ADJUST SECTOR #
1067 5C         0058        INCB              AND COUNTER
1068 C112       0059        CMPB  #18         ALL WRITTEN YET
106A 270D       0060        BEQ   RETURN      YES GO EXIT
106C 33C90100   0061        LEAU  256,U       NO ADJUST BUFFER POINTER
1070 20EA       0062        BRA   WRITE3      GO WRITE NEXT SECTOR
1072 BDA282     0063 D1     JSR   $A282       DISPLAY CHARACTER
1075 A680       0064 DISPLY LDA   ,X+          GET CHAR.
1077 26F9       0065        BNE   D1          NOT DONE GO DISPLAY IT
1079 39         0066 RETURN RTS               RETURN TO CALLER
107A BDA1B1     0067 GETCH  JSR   $A1B1       GO POLL KEYBOARD
107D 27FB       0068        BEQ   GETCH       NONE YET NO POLL AGAIN
107F 39         0069        RTS               GOT CHAR. RETURN
1080 C628       0070 IOERR  LDB   #$28        SET I/O ERROR IND.
1082 7EAC46     0071        JMP   $AC46       GO TO BASIC'S ERROR ROUTINE

1085 48         0073 MSG    FCC   /HIDE DIRECTORY TRACK ON TRACK 36/
10A5 20         0074        FCC   /        BY: HARRY HARDY/
10BC 0D         0075        FCB   $D,$D
10BE 20         0076        FCC   /    RESTORE OR SAVE DIRECTORY/
10DB 0D         0077        FCB   $D,$D
10DD 20         0078        FCC   /        ENTER  R  OR  S/
10F4 0D         0079        FCB   $D,$00

10F6            0081 IOBUFF EQU   *
1000            0082        END   BEGIN
        NO ERROR(S) DETECTED
```


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Listing 3:

```
10 ' THIS PROGRAM WILL CREATE TH
E PROGRAM TO INITIALIZE TRACK 36
20 ' AFTER YOU RUN IT TYPE SAVEM
"INIT36.BIN",&H1000,&H11A6,&H100
0
30 ' YOU CAN THEN TYPE LOADM"INI
T36" AND EXEC IT.
40 FOR X=4096 TO 4518
50 READ A
60 POKE X,A
70 NEXT X
100 DATA 189,169,40,48,141,1,53,
32,3,189
110 DATA 162,130,166,128,38,249,
189,161,177,129
120 DATA 13,38,249,134,0,151,235
,134,2,151
130 DATA 234,134,34,151,236,134,
18,151,237,48
140 DATA 141,1,124,159,238,189,2
14,108,13,240
150 DATA 39,5,198,40,126,172,70,
182,9,134
160 DATA 138,16,183,255,64,134,8
3,183,255,72
170 DATA 30,136,30,136,189,214,2
22,38,229,189
180 DATA 214,253,12,236,48,141,1
,79,204,32
190 DATA 78,141,47,95,52,4,51,14
1,0,174
200 DATA 230,197,215,237,51,141,
0,184,134,3
210 DATA 141,34,150,236,167,128,
111,128,150,237
220 DATA 167,128,134,9,141,20,53
,4,92,193
230 DATA 18,37,217,204,200,78,14
1,2,32,18
240 DATA 231,128,74,38,251,57,52
,2,236,193
250 DATA 141,244,53,2,74,38,245,
57,16,142
260 DATA 255,75,26,80,190,9,131,
182,9,130
270 DATA 52,18,48,141,0,34,191,9
,131,48
280 DATA 141,0,240,182,255,72,13
4,255,183,9
290 DATA 130,134,244,183,255,72,
182,9,134,138
300 DATA 128,183,255,64,166,128,
167,164,32,250
310 DATA 53,18,191,9,131,183,9,1
30,182,255
320 DATA 72,28,175,132,124,151,2
40,16,38,255
```


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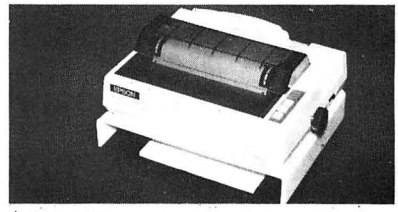
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```
330 DATA 77,48,141,0,188,159,238
,134,2,151
340 DATA 234,134,35,151,236,51,1
41,0,25,95
350 DATA 166,197,151,237,189,214
,108,13,240,16
360 DATA 38,255,45,92,193,18,37,
238,189,169
370 DATA 40,126,192,0,1,12,5,16,
9,2
380 DATA 13,6,17,10,3,14,7,18,11
,4
390 DATA 15,8,8,0,3,245,1,254,1,
1
400 DATA 1,247,22,78,12,0,3,245,
1,251
410 DATA 0,255,1,247,24,78,32,32
,32,32
420 DATA 32,32,73,78,73,84,73,65
,76,73
430 DATA 90,69,32,84,82,65,67,75
,32,51
440 DATA 54,13,32,32,32,32,32,32
,32,32
450 DATA 66,89,58,32,72,65,82,82
,89,32
460 DATA 72,65,82,68,89,13,13,32
,32,32
470 DATA 32,32,73,78,83,69,82,84
,32,68
480 DATA 73,83,75,32,73,78,32,68
,82,73
490 DATA 86,69,32,48,13,13,32,32
,32,32
500 DATA 32,72,73,84,32,69,78,84
,69,82
510 DATA 32,87,72,69,78,32,82,69
,65,68
520 DATA 89,13,0
```

Listing 4:

```
10 '   THIS PROGRAM WILL CREATE
THE PROGRAM TO HIDE THE DIRECTOR
Y
20 '   AFTER YOU RUN IT TYPE IN
SAVEM"HIDEDIR.BIN",&H1000,&H10F5
,&H1000
30 '   YOU CAN THEN LOADM"HIDEDI
R" AND EXEC IT.
40 FOR X=4096 TO 4341
50 READ A
60 POKE X,A
70 NEXT X
100 DATA 189,169,40,134,0,151,23
5,134,2,151
110 DATA 234,134,1,151,237,48,14
1,0,114,141
120 DATA 96,141,99,189,162,130,1
29,82,39,6
130 DATA 198,17,215,236,32,4,198
,35,215,236
140 DATA 51,141,0,202,95,223,238
,189,214,108
150 DATA 13,240,38,74,12,237,92,
193,18,39
160 DATA 6,51,201,1,0,32,234,12,
234,198
170 DATA 1,215,237,51,141,0,169,
129,82,39
180 DATA 6,198,35,215,236,32,4,1
98,17,215
190 DATA 236,95,223,238,189,214,
108,13,240,38
200 DATA 27,12,237,92,193,18,39,
13,51,201
210 DATA 1,0,32,234,189,162,130,
166,128,38
220 DATA 249,57,189,161,177,39,2
51,57,198,40
230 DATA 126,172,70,72,73,68,69,
32,68,73
240 DATA 82,69,67,84,79,82,89,32
,84,82
250 DATA 65,67,75,32,79,78,32,84
,82,65
260 DATA 67,75,32,51,54,32,32,32
,32,32
270 DATA 32,32,32,66,89,58,32,72
,65,82
280 DATA 82,89,32,72,65,82,68,89
,13,13
290 DATA 32,32,32,32,82,69,83,84
,79,82
300 DATA 69,32,79,82,32,83,65,86
,69,32
310 DATA 68,73,82,69,67,84,79,82
,89,13
320 DATA 13,32,32,32,32,32,32,32
,32,69
330 DATA 78,84,69,82,32,32,82,32
,32,79
340 DATA 82,32,32,83,13,0
```

Listing 5:

```
10 '       CRASH DIRECTORY
20 '     THIS PROGRAM CAN BE USED
 TO TEST THE HIDEDIR PROGRAM
30 '     AFTER YOU HAVE EXECUTED
HIDEDIR TYPE AND RUN THIS ONE
40 '     THEN EXECUTE HIDEDIR AGA
IN WITH THE R OPTION. THEN
50 '     TYPE DIR. YOUR DIRECTORY
 SHOULD BE RESTORED.
60 CLEAR 500
70 A$=STRING$(128,"*"):B$=STRING
$(127,"?")
80 DSKO$ 0,17,2,A$,B$
90 DSKO$ 0,17,3,A$,B$
100 DSKO$ 0,17,4,A$,B$
```

TURN
THIS PAGE
FOR A
SUPER
SPECIAL

THE BEST JUST GOT BETTER

FHL FLEX ONLY $69.95

FHL CC-FLEX has become the standard FLEX for the CoCo. Now you can buy CC-FLEX for only $69.95 for a savings of $30. CC-FLEX includes more extras, more utilities, and more functions than any other.

INCLUDES:

* **BEST PRICE IN THE WORLD!**
  At $69.95, CC-FLEX, with all these features, is the best price anywhere!
* **OFFICIALLY LICENSED TO FHL FROM TSC**
  CC-FLEX is an official licensed FLEX from TSC. Be wary of unlicensed implementations.
* **NEW SMOOTH SCROLLING**
  New with version 5.0:4 is SMOOTH scrolling. This is a feature not found on any other FLEX.
* **NEW VARIABLE RATE SCROLLING**
  Variable rate scrolling lets you control the speed that the screen scrolls, from smooth to very fast scroll. Also this version of CC-FLEX is 50% faster in scrolling than previous versions.
* **NEW 'TED' TINY EDITOR**
  Included with CC-FLEX at $69.95 is 'TED', which stands for Tiny Editor. TED is fine for small editing jobs and is the easiest editor to use of any available. You can learn how to use it in less than five minutes!
* **NEW 'ISM' INTERACTIVE ASSEMBLER**
  ISM is the program for those interested in assembly language but not convinced that they need to buy one. ISM is the perfect teaching tool to use to learn assembly language programming. You will need to use it in conjunction with a book on the subject (not provided). However, ISM includes a complete manual on its operation.
* **NEW EXTERNAL TERMINAL PROGRAM**
  If you want to run CC-FLEX connected to a terminal so that you can get the benefit of a real keyboard and full 24 x 80 display, then EXT will do it for you. EXT allows a standard terminal and printer to be connected to the CoCo. 'NEW' EXT now supports real hardware handshaking.
* **EASY START UP**
  Just type RUN"FLEX" or DOS if you have 1.1 Disk ROM. Quote from the June 1983 issue Hot CoCo. Re: FLEX by David Wasler, pg. 143, "It is the easiest to use. After you receive it, just put it in your drive and type RUN"FLEX"."
* **ONLINE "HELP" CAPABILITY**
  Just like the big mainframes, CC-FLEX has a help function. Just type 'HELP' and CC-FLEX will answer your questions and help you run FLEX without having to keep paging through the manual.
* **RECONFIGURABLE TO YOUR NEEDS**
  CC—FLEX'S powerful SETUP facility lets you change CC-FLEX to suit your needs and hardware. CC-FLEX is the only FLEX that gives you such complete control.
* **SUPPORTS ALL DRIVE TYPES AND SIZES, EVEN 3"**
  CC-FLEX supports every type of drive currently available for the CoCo. These include 35, 40 and 80 track single and double sided. Even the new 3 inch from AMDEX. We supply support software on the 3 inch drive.
* **SIX DIFFERENT HI-RES SCREENS**
  51 x 24 and 16 x 32 with true lower case, 64 x 24 and 64 x 32 all upper case. You can switch between these screens at will. The different scroll types are available for each screen type.
* **SUPPORTED BY THE LARGEST 6809 SOFTWARE FIRM IN THE WORLD!**
  FHL is the largest software house in the world for 6809 based computers! We have over 100 software packages for FLEX and OS-9. We support CC-FLEX like no other.

OPTIONS AVAILABLE AT EXTRA COST:

* **DBASIC -** Radio Shack Disk Basic adapted to work with FLEX.
  This is standard RS Disk Basic working with FLEX. This only works with FHL FLEX at this time. DBASIC has everything that RS Disk Basic has except for Direct access files and those functions that go with Direct access files.
* **ED/ASM -** Full feature Editor and Assembler
  SPECIAL now only $69.95! ED/ASM is the best Editor and assembler for the Color Computer. The editor is both screen and line oriented while the assembler is a full conditional macro assembler.

REVIEWS:

Quote from the June 1983 issue of HOT COCO. Re: FLEX by David Wasler, pg. 143.
"Frank Hogg Color FLEX has been on the market the longest and has the most software support. It is also the easiest to use. After you receive it, just put it in your drive and type RUN"FLEX"."

Quote from the March 1983 80 MICRO review by Scott Norman, pg. 101.
"I think CC-FLEX offers the most painless way of trying one's hand at an advanced operating system for the Color Computer. It offers quite a few "big machine" features, and opens the door for a lot of applications software."

Frank Hogg Lab brought FLEX to the CoCo over a year and a half ago. It has gone thru 5 updates since its original release in February 1982! FHL not only has FLEX, we support our FLEX with more software than anyone else in the world! We have over 100 software packages compatible with FHL CC-FLEX to fulfill all your needs. These range from languages, utilities and software development tools to data base management, word processing and business applications. We guarantee these programs will work with our FHL CC-FLEX and probably with any licensed version of FLEX!

And, there is no better way to purchase FLEX for less!!

So, order FHL CC-FLEX today and take advantage of our **SUMMER SPECIAL of $69.95** to bring out the true power of your CoCo!!

We will accept Prepaid, COD, VISA, M/C and Diners. Please include $3.50 for shipping and handling.

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THE BEST JUST GOT BETTER

ED/ASM .$69.95

FHL ED/ASM has been recognized as the most versatile package in its price range for FLEX. Now the best is less. Save $30 by buying ED/ASM.

LOOK AT THESE FEATURES
ED

ED is both line and screen oriented. This means that you can edit by line number or by using screen type editing where you move the cursor to where you wish to edit and then make your changes. The line editing mode is very handy for programming as most assemblers and compilers refer to line numbers when an error occurs, thus making it easy to correct if the editor like ED can go to a line number to edit. Once there, ED can switch to screen editing to make the corrections.

ED also has cut and paste type of editing, where you can split a line and move the other half. You can also delete and rename files on disk from ED, edit more than one file without leaving ED, and many more. Here is a list of features:

Menu will list the command set for ED
Set allows changing editor characters
Cursor allows changing cursor control strings.
X sends out a user defined string
Status list flags and other internal editor settings
Head allows setting and listing of headers and tabs
Tab allows setting tab stops
Width set screen width
Number toggle number flag
Renumber renumbers the lines
Verify toggle the verify flag
Zone set or reset the zone flag for string searches
Top go to the top of the text (also works)
Bottom go to the bottom of the text (! also works)
Next target line becomes the current line
Find finds target string
Append appends a string to the current line
Change changes this to that in the text
CChange like above but asks you first
Copy copy a block a text
Cut cut the current line at a specified column
Delete a line or block of lines
Expand tabs in the text
Insert insert after the current line
Move move a block of text
Overlay the line
Print a line or block of lines
Replace a line or lines
Splice a line to the current line
Stop save the text to disk and edit
Abort exit the editor without changing anything
New allows working with files larger than available memory
Edit restart the editor with a new file
Dir list the directory of the disk
Read insert a file from disk into the file in memory
Write write a block of lines to a file on disk
Save save the file to disk
List list a line or group of lines
FEDL deletes a file on disk
FREN renames a file on disk
CMACRO create a macro
LMACRO list one or all macros
DMACRO delete a macro
MACRO execute a macro
CALCULATE performs math functions with results in binary, decimal, and hex
EXEC exec a text file as a set of commands for the editor
Bell rings the terminal bell (useful in macros)
REM used to document macros.

As you can see, ED is a very versatile and powerful editor for all your editing needs. It is particularly useful for the programmer that needs a flexible editor!!

LOOK AT THESE FEATURES
ASM

ASM is a fast and versatile (8 bit) macro assembler. It has the necessary elements to support structured constructs like WHILE and FOR etc. These are the ability to define macros with substitutable parameters, conditional assembly directives, and the ability to change the value of a label or symbol. In addition, source code may be assembled in modular form. That is as a series of LIBrary files. A short file containing a list of file specifications in standard assembler source format may call as many library files as desired. Symbols default to a maximum length of 6, but may be redefined to a maximum length of 3 to 30 characters.

ASM supports auto fielding and automatic label generation. Labels may be automatically generated and accessed within expressions.

This function has great power when used within macros. An example is the BASIC statement PRINT "HI". A macro would be created as:

```
An example would be:          PRINT MACRO              would expand into:
        BRA :1                        LDX #:1                  PRINT "HI"
        FCC "HI",4                    JSR PSTRNG               LDX L0001
      : EQU *                         BRA :2                   JSR PSTRNG
becomes:                          : FCC "&1",4                 BRA L0002
                                  : EQU *                L0001 FCC "HI",4
        BRA L0001                     ENDM               L0002 EQU *
        FCC "HI",4
L0001   EQU *
```

ASM supports the following directives or pseudo operators.

FCC	form constant character(s)	**MACRO**	define a macro
FCS	form constant string	**ENDM**	end a macro definition
FCB	form constant byte	**EXITM**	exit macro being called
FDB	form double byte	**DUP**	duplicate lines n times up to 'ENDD'
SPC	insert spaces in the output listing	**ENDD**	end duplication bracket
LEN	set up length of output line for printing	**IF**	conditonal assembly control
OPT	switch assembler options	**ELSE**	complement true-false flag
PAG	skip to next page	**ENDIF**	end conditional assembly clause
ORG	define a new origin (*)	**ENDC**	end conditional assembly clause
RAM	define a new storage counter origin (.)	**WHILE**	incremental conditional assembly control
EQU, SET	(re-) assign a value to a symbol	**WELSE**	complement sense of WHILE test
END, MON	signal end of source code	**ENDW**	end WHILE clauses
NAM, TTL	specify a name or title	**LIB**	open a library source code file
STTL	specify a subtitle	**SYM**	define length of significant characters for symbols
RMB	reserve memory bytes		
ERR	print error message		
RPT	repeat following line n times		

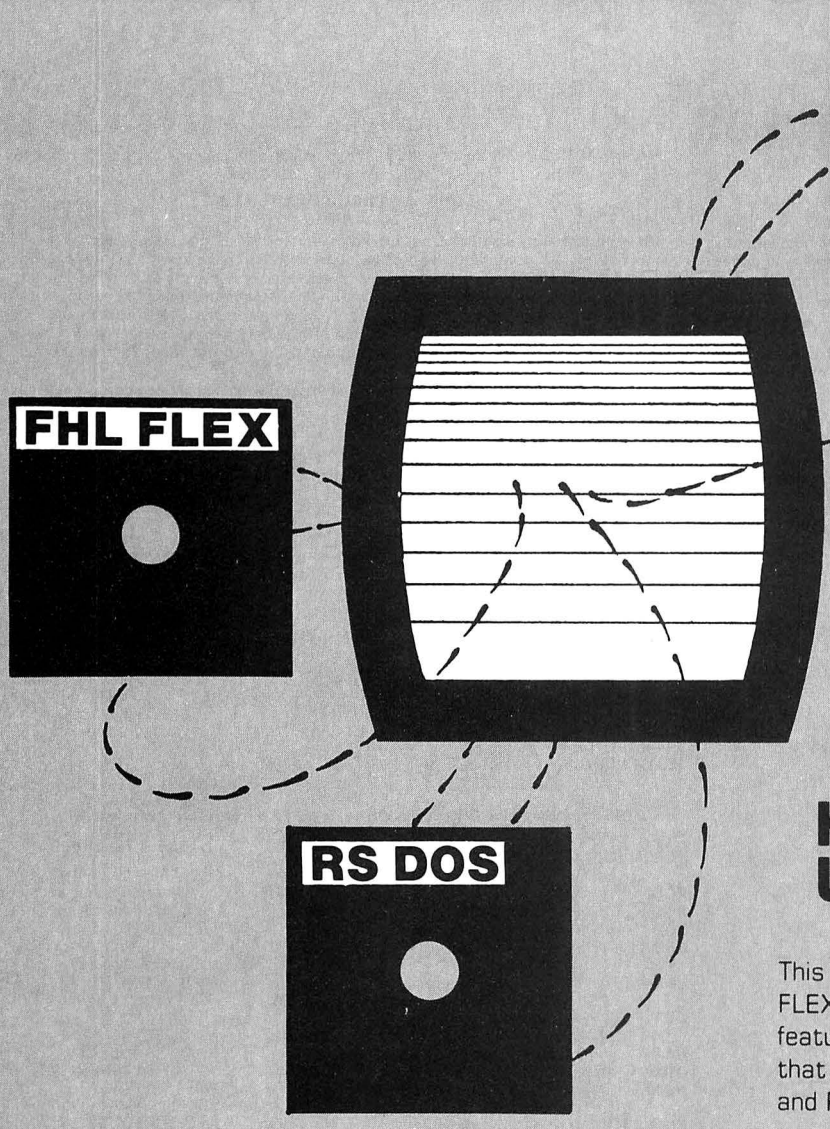
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O-PAK

O-PAK for OS-9

Hi Res Screen & Utilities Package

This is the same Hi-res screen that is used on FHL FLEX. Using the same control codes and the same features. The utilities include a three way copy utility that allows copying files between FLEX, OS-9 and Radio Shack DOS. For CoCo OS-9 - **$34.95**

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A/BASIC COMPILER
(Basic Compiler for OS-9 and FLEX)

This BASIC compiler generates pure, fast efficient 6809 machine code from easy to write BASIC source programs. *Uses ultra-fast integer math, extended string functions, boolean operators and run-time operations. Output is ROMmable and RUNS WITHOUT ANY RUN-TIME PACKAGE. Supports IF-THEN-ELSE structure and random access. Supports the following statements:

REM, END, CALL, FOR/NEXT, GOSUB/RETURN, IF/THEN, ON ERROR GOTO, ON-GOTO/ON-GOSUB, STOP, GEN, STACK, INPUT, PRINT, CLOSE FILES, OPEN, CLOSE, WRITE, RWRITE, READ, RREAD, CHAIN, RESTORE, SCRATCH, KILL.

Includes Chess in A/BASIC source.

Comment: A/BASIC does not compile RS Basic or any other Basic. It is an integer only (no floating point), version of BASIC. It can be used for games and graphics, but it has no built in functions for them. A/BASIC is a powerful addition to your library, and it does not require a license to use or sell the compiled code produced from it. FH

Written for 6809 OS-9 or FLEX
Available for the Color Computer

Object only **$150.00**

* Source programs on disk.

DYNASOFT PASCAL

Dynasoft Pascal is a portable p-code implementation of a Pascal subset specifically tailored for small scale microcomputer systems.

Dynasoft Pascal is PASCAL SUBSET which includes the control structures of standard Pascal and supports the data types INTEGER, CHAR, BOOLEAN, scalar (enumerated), subrange, pointer, and ARRAY, along with the dynamic memory management functions NEW, MARK, and RELEASE. Its design is such that it is virtually impossible to write "spaghetti code", and the result is programs that are highly structured and highly readable.

Dynasoft Pascal is COMPLETE. It includes a fast one-pass compiler, a p-code interpreter, a supervisor program, and program SAVE, and LOAD routines that can be adapted for media ranging from paper tape to cassette to floppy disks. For speed-sensitive applications there is a built-in interface to machine language routines complete with parameter passing.

Dynasoft Pascal is COMPACT. The entire system will run on systems with as little as 12K of available RAM without overlaying. It produces ROMable p-code which is also compact:a typical algorithm compiles to less than half the size of the same algorithm expressed in the native code of an 8-bit processor. This means that you can get a lot of program in a surprisingly small amount of memory.

Dynasoft Pascal is PORTABLE. It is currently available for systems based on the 6809 microprocessors and more are planned. Programs written in Dynasoft Pascal are compatible at both the source and p-code levels: they can be transferred to a new machine without even re-compiling.

Written for OS-9 and FLEX

OS-9 Object only	**$69.95**
w/run-time source	**$99.95**
FLEX Object only	**$59.95**
w/run-time source	**$89.95**

Available for CoCo OS-9 and FLEX

New for OS9 and FLEX9
DYNA-C

Dynasoft sets a new price/performance standard with Dyna-C: a new Small-C derivative unlike all the others. Dyna-C produces compact, ROMable, position-independent, re-entrant, OPTIMIZED code that runs circles around anything in its price class. "C" for yourself:

As compared to Introl-C, Wordsworth 2.0, Duggers, and Intersoft, Dyna-C has the fastest Compile/load time, the fastest execution time and the lowest price. (All timings under FLEX9 at 1 MHz using sieve benchmark from Sept 1981 Byte.)

Dyna-C supports a large subset of standard C, including all statement types, most operators (including ?: and ,), and all data types except float, long, unsigned, struct, multidimensional arrays and bitfields. It goes from your source to executable binary in two quick steps: the one-pass compiler with built-in pre-processor AND OPTIMIZER produces assembly code which is assembled straight to binary using any standard 6809 assembler (including TSC's ASMB, Microware's ASM, Lloyd I/O's OSM and FHL's ASM). While this means maintaining libraries in assembler source form it actually saves disk space and time by eliminating the loader step. It also supports separate compilation so you can split large programs or build your own libraries from C.

Source code for the entire runtime system is supplied, so you can customize to your own needs. Requires 36K of user RAM.

OS9:	**$109.95**
FLEX	**$ 99.95**

Available for the Color Computer

INTROL-C/6809 C LANGUAGE COMPILER

The Introl-C/6809 C language compiler system is an effective and field-proven set of software tools for developing programs, in C, for 6809-based target applications. Introl-C produces efficient, compact programs with fast execution speed.

The Introl-C/6809 compiler system is itself written entirely in C and the package consists of the following software: C Compiler, Macro Relocating Assembler / Linking Loader, Runtime Library, and Library Manager. Compiled programs are re-entrant, relocatable, and ROMable.

The current release of the FLEX and OS-9 compatible Introl-C/6809 compilers - ver. 1.4 - is a comprehensive implementation which fully supports all standard C as defined by Kernighan & Ritchie except bitfields and doubles. Bitfields and doubles are scheduled for implementation in the FC6809 and OC6809. Existing versions of these compiler types are fully upgradeable to include these features, as they become available.

FLEX or OS-9 **$375.00**
Available for the Color Computer

MICROWARE CIS COBOL COMPILER

The 6809 CIS COBOL compiler is the result of a joint effort by Microware and Micro Focus-the world leader in microcomputer COBOL."CIS" stands for Compact, Interactive, and Standard: making CIS COBOL ideal for microcomputer business applications. CIS COBOL meets the ANSI standard for Level One COBOL plus selected features from Level Two and is certified as such by the U.S. General Services Administration. It features:

* Sequential, Relative and Indexed (ISAM) files
* Interprogram communication including CALL and CANCEL
* Nested IF and nested REDEFINES
* PERFORM...UNTIL statement
* ON OVERFLOW statement
* Comparison of non-numeric operands of unequal length
* Full Level One implementation of Library and Segmentation
* Includes DEBUG module
* Device-Independent Input/Output

OS-9 **$895.00**

COMPUTERWARE'S RANDOM BASIC

With 11 digits of precision, Random Basic conforms closely to the ANSII standard, thus allowing the user to run standard BASIC programs with few, if any, changes.

FLEX	**$100.00**
OS-9	**$195.00**
CoCo versions	**$75.00**

OSM -
A 6809 Macro Assembler for FLEX and OS9

OSM is a MACRO Assembler with CONDITIONAL Assembly directives and other extended commands that are not found in other assemblers. If you write programs for OS9 and/or FLEX then OSM is for you because it generates OS9 or FLEX machine language binary files.

FEATURES:

* Motorola standard mnemonics and addressing modes
* 2 passes to generate object code

* library file calls nestable to 12 deep
* conditional assembly nestable to any depth
* macros nestable to any depth, with parameters
* variable length symbols up to 32 characters
* 2048 maximum symbols
* automatically generated labels and symbols
* errors tell file name and line number
* object code format for OS9, FLEX, or neither

For those users who write programs for FLEX and/or OS9, this assembler will allow you to support your source code files on one system. OSM can generate OS9 or FLEX formated binary object code files under either disk system.

OSM supports the assembler directives for structured assembly language programming. Symbols may be upper or lower case, an option sets up a flag which tells whether or not lower case characters are the same as upper case. Symbols can be defined at a maximum length of 32 characters. A directive sets the maximum before any symbols are defined. OSM for FLEX defaults to 6 characters while OSM for OS9 defaults to 8 characters.

Written for FLEX or OS-9 **$99.00**
Available for the Color Computer

CRASMB - MACRO CROSS ASSEMBLER for FLEX and OS9

CRASMB is a macro-conditional cross assembler. It uses machine language overlays or modules called "CPU Personality Modules"to do the work of mnemonic look up. It has directives and other extended commands that are not found in other assemblers. It generates OS9 or FLEX binary files.

FEATURES:

* Cross assembles 8 CPU types: Motorola 6800-2-8, 6801-3, 6805, 6809 Mostek 6502, RCA 1802, INTEL 8080-5 ZILOG Z-80
* 2 passes to generate object code
* library file calls nestable to 12 deep
* conditional assembly nestable to any depth
* macros nestable to any depth, with parameters
* variable length symbols up to 32 characters
* 2048 maximum symbols
* automatically generated labels and symbols
* errors report file name and line number
* object code format for OS9, FLEX, or neither

For those users who write programs for FLEX and/or OS9, this assembler will allow you to support your source code files on one system. CRASMB can generate OS9 or FLEX formated binary object code files under either disk system.

This program is the most powerful assembler on the market today allowing the programmer to use a single computer system as a development system for many processors. The user may purchase the source code for the CPU Personality Modules (CPM's) so that it may be modified to create a new assembler for a processor not yet supported.

Written for 6809 FLEX and OS-9
Color Computer versions available in both FLEX and OS-9 **$200.00**

CPM's (CPU Modules) **$ 35.00**
w/ source **$ 70.00**

SPECIAL: Purchase CRASMB with all CPU modules w/source for FLEX or OS-9
*** $499.00 ***

CROSS ASSEMBLER MACROS

This set of macros for the TSC Macro Assembler (for FLEX) or the OSM Macro Assembler (for OS-9 or FLEX) provides the user with the capability of using a 6800/1/9 computer system for program development for 6800/1, 6805, 6502, 8080/5, and Z80 systems, using the assembler language format normally used on the target machine.

OS-9 **$55.00 each** or **3/$110.00**
FLEX **$50.00 each** or **3/$100.00**

Also available for the Color Computer

SUPER SLEUTH

Super Sleuth is a set of programs which enable the user to examine and/or modify binary program files on disk or in memory on 6800, 6801, and 6809 systems. Programs may be disassembled into source code format and the source may be displayed, printed or saved on disk.Labels produced by SLEUTH can be changed globally to labels of the user's preference.Cross-reference listings of labels in any Motorola assembler-formatted source file may be produced to aid in debugging or modifying the program.Programs in ROM may be altered with the revised program being saved on disk; the resultant program could then be used to program a new ROM.Object code for 6800, 01, 02, 03, 05, 08, 09, or 6502 may be processed. 6800, 01, 02, 08, 09 object code may be easily converted to 6809 position-independant code.

Z-80 SUPER SLEUTH

This version of SUPER SLEUTH analyzes Z80, 8080, 8085 object programs.It is otherwise virtually identical to the other version of SUPER SLEUTH.

Object only versions:
CoCo OS-9 **$ 49.95**
CoCo FLEX **$ 50.00**
RS DOS **$ 49.00**

FLEX or OS-9 with Source: **$ 99.00**
UniFLEX: **$100.00**

Specify 6809 or Z-80

DYNAMITE +

DYNAMITE + is a new version of the DYNAMITE disassembler. It does everything that DYNAMITE did and more! A cross-reference generator has been added, label files are now maintained only in text form (LABEL EQU $xxxx), and boundary file specifications have been tremendously simplified, which makes it easier to disassemble large programs containing large tables.

Written for OS-9, FLEX

OS-9 **$150.00**
FLEX **$100.00**

Available for the Color Computer

6800-6809 and 6809 PIC/PID TRANSLATORS

The 6800-6809 translator converts 6800/1 assembler-language programs to 6809 assembler language programs by converting 6800/1 opcodes to sequences of one or more 6809 opcodes. The 6809 PIC/PID translator assists in converting 6809 assembler-language programs to position-independent code and data, using PC, S, U, X, and Y as base registers.

FLEX **$50.00**
UniFLEX **$60.00**
OS-9 **$75.00**

EDIT/ASSEMBLE for OS-9

This Editor and Assembler package is much more powerful than the programs inclusive with CoCo OS-9. The Edit features "Screen-like" line editing capabilities, and Assemble is a Conditional Macro Assembler.

CoCo OS-9 **$69.95**

DYNASTAR

SCREEN EDITOR/ WORD PROCESSOR FOR OS9 & FLEX

DynaStar is a powerful, menu-driven screen editor equally suited to the tasks of program preparation and document processing. With the addition of the optional DynaForm print formatter/mail-merge program it is a complete word processing package for your OS9/FLEX system.

DynaStar Version II features no-nonsense "what you see is what you get" editing. To edit, simply move the cursor where you want it, and type. Any printable character you type is entered directly into your text, and any non-printable control character is interpreted as an editing command and is executed immediately. It's that simple! Single keystroke commands move the cursor in any direction, by character, word, tab, line or screenful, and delete characters, words, or a whole line. Two keystroke commands augment the simple commands by moving the cursor to the left or right margins, top or bottom of the screen, next paragraph, or the top or bottom of the edit buffer. You can search for a string, replace it with another, do it again, mark text blocks, move, copy or delete blocks, write them to side-files, read them in somewhere else, set tabs and margins, and center lines.

DynaStar features automatic word-wrap, and optional right justification right on the screen as you go, so you see how it will look BEFORE you print it. For programmers there is an auto-indent mode to help you write those well-structured programs. DynaStar permits editing of long files without having to break them

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up, and the OS9 version will even let you go back to the Shell to do almost anything you want (including edit another file) without even losing your place.

DynaStar includes a unique macro facility to let you define more powerful commands by converting any control character to a command/text string of your choice. You can use this feature to completely remap your keyboard if you don't like the way we did it, and you can provide a special "startup string" which is processed every time you enter the editor to customize the editor to your own taste.

For complete word processing, the optional DynaForm text formatter provides all the standard features including pagination, headers and footers, single, double, and multiple spacing, boldface, double-strike, and underline. DynaForm has its own macro facility with string variables, nested include files, FULL MERGE/PRINT facilities, and automatic generation of Index and Table of Contents.

DynaStar for OS9 or FLEX	**$149.95**
DynaForm for OS9 or FLEX	**$149.95**
Purchased together	**$275.00**
Color Computer versions:	
DynaStar	**$ 90.00**
Dynaform	**$ 90.00**
Purchased together	**$175.00**

SPECIAL NOTE TO COLOR COMPUTER FLEX USERS:

Because DynaStar does its formatting on the screen, UNLESS you are using an external terminal the 51 x 24 CoCo FLEX format will limit its usefulness as a general word processor. DynaStar still makes an excellent screen editor for your programming needs and can be teamed up with the TSC text formatter (which formats at print time) to do word processing.

DO - Job Control Language for OS-9

"DO" is an easy to use Job Control Language for OS-9. BASIC like in nature, this new language was designed to be used primarily for Batch processing.

DO uses a minimum of 8.5K user memory. More may be allocated when the user application exceeds buffer size. DO has 26 number and 9 string variables. It also supports ON ERROR GOTO, allows parameter passing, and the use of labels.

DO contains the following directives: REMARK, TRACE-ON, TRACE-OFF, LET, GOTO, GOSUB, RETURN, ON ERROR GOTO, RESUME, REPORT, F, FC, PRINT, INPUT, READ, END, and CHAIN.

DO procedures may be chained or nested by using the DO command as an OS-9 command. The manual includes a "Procedure Library" of examples.

CoCo OS-9 version	**$49.00**
General OS-9 version	**$99.00**

RMS RECORD MANAGEMENT SYSTEM

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'Repainting' a *PMODE 4* Rainbow

By David King

How would you like to be able to write your next Color Computer or graphics game using a black background, lots of bright colors, and a 256 x 192 resolution screen, and all in BASIC? Sound impossible? Read on! The technique used is not new—I first discovered it in an article by George Fraser in the June, 1982 *TRS-80 Microcomputer News* titled "Texture." The article gave a machine language program to create the effect, but since I am a confirmed BB (BASIC bigot) I noted the program but never tried it. Eventually my curiosity got the better of me and I decided to see if I could write the routine in BASIC to make it easier to use with another BASIC program. I ended up with two versions of the routine, each with advantages and disadvantages as we shall see later. I have since discovered that the idea has been around for years before that, and it is capitalized on in the system software of at least two other popular home computers.

The technique, which I imagine was first discovered by accident, counts on the limitations of a standard TV. A TV is naturally designed to receive TV signals, and these signals must meet an industry encoding standard set. This standard requires the circuitry to be able to properly handle a maximum of about 180 pels (pixels) on a line. When this standard is exceeded, the TV is not required to perform as expected. The trick is to turn this limitation into an advantage. This can be done with the Color Computer by using *PMODE4 (SCREEN1,1),* which uses 256 pixels per line and thus exceeds the standard, and places repetitive bit patterns such as 00110011 in the memory graphics screen area. While 1 bits should produce white and 0 bits black, the rapidly changing pattern "fools" the TV and the desired magic of what has been best described as "false colors" occurs.

Now that we understand a little of the theory, here's how my REPAINT routines put this effect to work. First, on a *PMODE4* screen with a black background you draw a figure and paint it white. Since in *PMODE4* each pixel is represented by one bit in memory, this will give us a lot of 0 bits for the black area with 1 bits where the figure was painted. Then my routine is called, after having previously set variables indicating the area to be "repainted" and the bit patterns (masks) to be used. The routine will then selectively reset bits in the painted area so that the resulting pattern matches the masks and the desired effect is produced.

Before we look at the detailed operation of the routines, we need to discuss the specification of the bit patterns. My programs require the selection of two "masks," which may be identical, and a "shift amount," which may be zero. The masks are represented by an integer between 0 and 255, with repetitions of the binary form of the number being the bit pattern for a pixel row in memory. The two masks are used for adjacent rows, and this row-pair is repeated to fill the area to be colored. For example, the masks 51 and 204 would result in a bit pattern in memory of:

```
00110011
11001100
```

Now, what about the shift amount? This is a number from 0 to 7 which represents the number of bits the row-pair is shifted right each time before being replicated. Here's another example—masks 136 and 68 and a shift amount of two:

```
10001000
01000100
00100010
00010001
```

While and understanding of the masks is needed to experiment with the program, it is not needed to use it. Here is a

(David King, an electrical engineer, is a twenty-year veteran in the field of large-system computer design. His programming experience includes computer performance simulation and computer-aided design. At home he works with stained glass, woodworking, home construction, and also teaches BASIC *at a computer-oriented Explorer Scout Post.)*

list of values that will give you good results.

M1	M2	S	COLOR
85	85	0	red
170	170	0	blue
85	255	0	light blue stripes
170	255	0	light red stripes
17	17	2	blue/black checkered
34	34	2	red/black checkered
187	187	2	yellow/green checkered
119	119	2	violet/blue checkered
153	102	0	medium green textured
204	51	0	medium violet textured
238	238	0	yellow/green stripes
119	199	0	violet/blue stripes
238	187	0	light green textured
119	221	0	light violet textured
170	85	0	red/blue stripes
136	68	2	red/blue checkered

The first two entries are the colors you get with the trick of defining objects in *PMODE3* and then switching to *PMODE4*, and are also the ones frequently seen in machine language games. While the remainder of the parameter combinations do not result in pure colors, I'm sure that you will find plenty of uses for their unique colors and textures.

Now let's look at the routines. Listing 1 contains a program I've called *SLOW-PAINT*. When you use it, you will know where it gets its name. To help, there are speedup *POKEs* in lines 2000 and 2030 that you may remove if necessary. All variables used in the routine are listed in the comments. To evoke the program, set the variables for the masks, shift amount, and the X,Y coordinates to start repainting. This routine could also have been called *DUMB-PAINT*, because its algorithm is simple. It starts at the point given, proceeds right on the row, resetting bits to match the mask as it proceeds, until it finds a 0 bit, which marks the boundary of the painted area. It then returns to the starting point and does the same to the left, once again returning to the starting coordinate when the boundary is encountered. It then steps down one row and repeats the process. When the downward step encounters a 0 bit the routine terminates. Be sure to use an even number for the X coordinate; more on this later. This simplified painting process will not handle complex shapes in one pass, but multiple calls to the routine with appropriate starting points should handle most, if not all, shapes. A better algorithm is left as an exercise for the student. Think about it—you'll come to appreciate the BASIC *PAINT* function a lot more!

"Now that I have psyched you up I must confess that there are a few drawbacks to this technique. First, . . . the edges of your figures may suffer distortion. I feel this is a small price to pay for the overall gain. Second, and last, is the 'great mystery'. . . "

The demo will draw a pie cut into four different colored pieces. The actual operation of the routine is a little hard to follow because of the optimization that I felt was necessary to maximize performance, but it should be understandable with the help of the variable definitions. Note the absence of *GOTOs*, which would have created a real slowdown if this routine was properly tucked away at the end of a large program. In particular, look at the use of the undocumented STEP 0 in line 2060, which creates a "loop-forever" situation, thus avoiding a *GOTO* at line 2120. The loop is exited in line 2080 by setting the loop variable Q1 to 1.

The routine shown in Listing 2 is appropriately called *FAST-PAINT*. What it gains in speed over its brother it, unfortunately, loses in precision. It uses the blunderbuss approach; you specify the upper left and the lower right coordinates, as in *GET*, for example, and it sets everything in that box that has already been painted white to the selected bit pattern. More than that, it works on byte boundaries, so the area covered may extend up to seven pixels to the left and right of the X points specified. This routine should be easy to follow with the comments and variable definitions. To aid in readability, I violated an important rule of maximum performance coding; all the constants used in the various calculations should have been placed in variables at the start of the routine. While the speed of this routine isn't too bad, you might want to make this change, along with adding in the high-speed *POKEs*. The approach used for the repainting is to *PEEK* a byte from the graphics screen buffer, *AND* it with the appropriate mask, and *POKE* it back. The screen buffer byte addresses are calculated from the X/Y pixels location by the formula: 1536+INT (X/8)+32*Y, where 1536 is the start of the buffer area. (For disk systems I believe that this address should be changed to 3584.) This routine was only designed to handle shift amounts of 0 and 2. While I haven't found other values to be of interest, you may try for yourself by using the first routine, which will take any value from 0 to 7.

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may try for yourself by using the first routine, which will take any value from 0 to 7.

The *FAST-DRAW* demo program will draw 16 rectangles on the screen using the values in the preceding table. I suggest that you enter this program first to best see what this technique can accomplish.

The parameter values that I have suggested were discovered by an only semi-rigorous search, and I bet there are some good ones that I have missed. Please feel free to experiment and, if you uncover some new ones, I would like to hear about it. In that way, I could act as a clearing house and pass on additional collections to everyone at some later time. I also have some reason to believe that repetitive patterns longer than a byte might give good results, but I haven't had time to check that one out.

Now that I have psyched you up I must confess that there are a few drawbacks to this technique. First, you will find that the edges of your figures may suffer some distortion. I feel this is a small price to pay for the overall gain. Second, and last, is the "great mystery"—when you turn on the computer you never know exactly which colors you will get! Sometimes the parameters "85 85 0" will give you red and sometimes blue. The unpredictability is only partial, reds always alternate with blues and violets with yellows. This isn't as bad as it sounds since the results always seem to turn out pleasing with whatever color "set" you end up with. If you don't like what you get the first time you can try stopping the program, pressing the Reset button, and running it again. If you do this enough times, you will sooner or later get what you want. The same switching of colors can be achieved by changing the alignment of the bit patterns in memory. You can see this from my table; a mask of 85 (red) is 170 (blue) when shifted one bit to the left. That is why I suggested that you always begin the repainting with the *SLOW-PAINT* routine on an even X value—you will get consistent, if not predictable, results. *FAST-PAINT* doesn't have that problem; an even alignment is always used. If someone knows why this happens I'd love to know. Better yet, how can this problem be avoided?

In closing, if you hardware-types would like to learn more about this effect, the following articles have been recommended to me:

**Byte*, Dec. 1980. "A Simplified Theory of Video Graphics, Part 2"

**Apple Orchard*, Fall 1980, "Apple II Hi-Res Graphics: Resolving the Resolution Myth"

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```
200 .....023D
2000 .....045D
END .... 05DC
```

Listing 1

```
10 '*** PMODE4 SLOW-PAINT DEMO
20 '
30 PCLEAR 4:PMODE 4,1:PCLS:SCREE
N 1,1
40 CIRCLE (128,96),20,,.9 'DRAW
CIRCLE
50 PAINT (128,96)
60 COLOR 0
70 DRAW "BM128,96;NE12NF12NG12NH
12" 'DIVIDE INTO 4 SECTIONS
80 FOR I=1 TO 4 'PAINT EACH SECT
ION
90 READ H1,V1,M1,M2,SI
100 GOSUB 2000
110 NEXT I
200 GOTO 200
210 DATA 128,79,85,85,0
220 DATA 114,85,170,170,0
230 DATA 128,97,17,17,2
240 DATA 142,85,34,34,2
1000 '***
1010 '*** PMODE4 SLOW-PAINT ROUT
INE
1020 '
1030 'GLOBAL VARIABLES:
1040 '   M1 - MASK 1
1050 '   M2 - MASK 2
1060 '   SI - SHIFT AMOUNT
1070 '   H1,V1 - START PAINT POSI
TION
1080 'LOCAL VARIABLES:
1090 '   QM - CURRENT MASK
1100 '   QS - MASK SELECT SWITCH
1110 '   QP - MASK BIT POINTER
1120 '   QB - MASK BIT PTR. START
 POSITION
1130 '   QX,QY - POSITION TO TEST
/RESET
1140 '   QD - X DIRECTION OF PAIN
T
1150 '   Q1,Q3 - LOOP VARIABLES
1160 '
2000 POKE 65495,0
```

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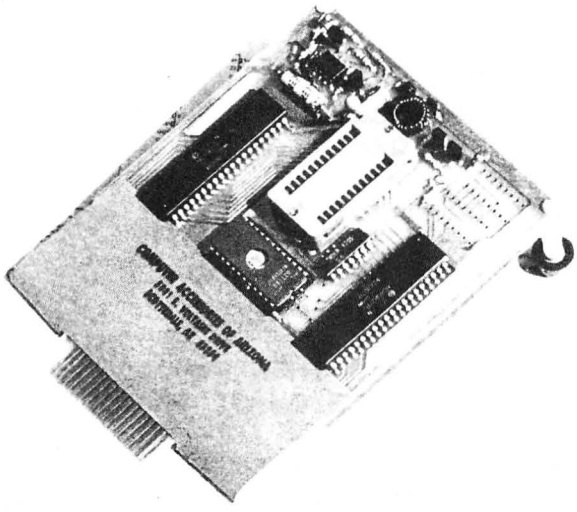
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```
2010 QM=M1:QS=1:QB=1
2020 FOR QY=V1 TO 1000
2030 IF PPOINT(H1,QY)=0 THEN POK
E 65494,0:RETURN
2040 QP=QB:QX=-1:QD=1
2050 FOR Q3=1 TO 2
2060 FOR Q1=0 TO 1 STEP 0
2070 QX=QX+QD
2080 IF PPOINT(H1+QX,QY)=0 THEN
Q1=1
2090 IF (QM AND (2^(8-QP)))=0 TH
EN PRESET(H1+QX,QY)
2100 QP=QP+QD:IF QP>8 THEN QP=1
ELSE IF QP<1 THEN QP=8
2110 NEXT Q1
2120 QD=-1:QX=0:QP=QB-1: IF QP<1
 THEN QP=QP+8
2130 NEXT Q3
2140 IF QS=1 THEN QS=2:QM=M2 ELS
E QS=1:QM=M1:QB=QB+SI:IF QB>8 TH
EN QB=QB-8
2150 NEXT QY
```

```
110 ..... 0246
1070 .... 03CD
END ..... 05EE
```

Listing 2

```
10 '*** PMODE4 FAST-PAINT DEMO
20 '
30 PCLEAR 4:PMODE 4,1:PCLS:SCREE
N 1,1
40 FOR Y=50 TO 100 STEP 50
50 V1=Y: V2=Y+20 'Y LIMITS
60 FOR X=32 TO 200 STEP 24
70 H1=X:H2=X+16 'X LIMITS
80 LINE (X,Y)-(X+16,Y+20),PSET,B
 'DRAW BOX
90 PAINT (X+1,Y+1)
100 READ M1,M2,SI 'GET MASKS, IN
CREMENT
110 GOSUB 2000 'DO IT
120 NEXT X,Y
130 GOTO 130
200 DATA 85,85,0,170,170,0,85,25
5,0,170,255,0
210 DATA 17,17,2,34,34,2,187,187
,2,119,119,2
220 DATA 153,102,0,204,51,0,238,
238,0,119,119,0
230 DATA 238,187,0,119,221,0,170
,85,0,136,68,2
1000 '***
1010 '*** FAST PMODE4 PAINT ROUT
INE
1020 '
1030 'GLOBAL VARIABLES:
1040 '   M1 - MASK 1
1050 '   M2 - MASK 2
1060 '   SI - MASK SHIFT AMOUNT (
0 OR 2)
1070 '   H1,V1,H2,V2 - PAINT BOUN
DARIES
1080 'LOCAL VARIABLES
1090 '   Q1,Q2 - "WORKING" MASKS
1100 '   QW - MASK SELECT SWITCH
1110 '   QM - CURRENT MASK
1120 '   QA,QB - TEMPS
1130 '   QX,QY - LOOP VARIABLES
1140 '
2000 Q1=M1:Q2=M2:QM=M1:QW=0
2010 FOR QY=V1 TO V2
2020 QB=1536+QY*32
2030 FOR QX=INT(H1/8) TO INT((H2
+8)/8)
2040 QA=QX+QB 'CALC. BYTE ADDRES
S
2050 POKE QA,QM AND PEEK(QA) '"A
ND" BYTE WITH MASK
2060 NEXT QX
2070 IF QW=0 THEN QW=1: QM=Q2: G
OTO 2090 ELSE QW=0: QM=Q1 'SWITC
H MASKS
2080 IF SI<>0 THEN Q1=INT(Q1/4)+
(Q1-INT(Q1/4)*4)*64: Q2=INT(Q2/4
)+(Q2-INT(Q2/4)*4)*64: QM=Q1 'RO
TATE MASKS RIGHT 2 BITS
2090 NEXT QY
2100 RETURN
```


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What Is Computer Literacy?

By Michael Plog, Ph.D.

I want to tell you about three students. The first one just entered high school this year. During his junior high school career, he had some microcomputer training; he even wrote a program. (This boy is my son, in case you are wondering.) During a mathematics course, one option for a special project was to write a computer program. After some thought, he decided to write a computer program to calculate a Spearman's rho correlation. That's a statistical way of telling how closely two sets of ranked items correlate with each other. It is simply amazing what junior high students are being taught these days! I helped him with some of the BASIC commands, but he wrote the program, based on the steps he took to solve the problem on paper. The Color Computer performed the task with ease, as expected. The program had no bells and whistles, but it produced the desired end result. My son was impressed with the speed of the machine, and seeing something he had created actually work.

A second student, a girl, graduated from high school last summer, and is a student at a state university now. She is an extremely bright student, and was placed in advanced courses in high school. This girl (well, young woman) took a computer course in high school—it was required. After this one course, she showed no interest in computers at all. She does not even enjoy playing games! About the only thing she wants to do on the machine is learn how to type. Now don't misunderstand—there is no sex role rigidity here. She is not at least interested in learning secretarial skills. She just realizes that in the very near future, anyone not knowing how to type will be functionally illiterate.

The third student also graduated from high school last summer, and is now attending college. When this young man was a mere boy, his parents bought him a Color Computer. He went through several stages, from playing games to learning how to program to advanced knowledge about the internal workings of the Color Computer. When this fellow was a sophomore in high school, he "inserviced" the teachers in his building on the use and potential of computers. (Sophomore means 10th grade, folks!) The assistant superintendent of the school district learned a lot about computers from this lad, and then helped establish a computer consortium of several school districts.

So, we have these three students. You probably know of students similar to each of the three described above. Each of the three students described above have needs that must be addressed by educational institutions. And while you may think this is heresy, it is my position that the second boy mentioned (the proficient programmer) does *not* represent the greatest need to be addressed by our schools.

"It is easy, but dangerous, to forget that literacy about computers is not necessarily an end in itself—it is a way to get to many ends."

Let's shift mental gears for a minute. The recent publication of the Commission on Excellence in Education caused quite a stir a few months ago.

There are mixed reviews about the recommendations of the commission. (Generally because of special interest groups, but also because the commission was "stacked" in favor of those people already representing the views of the administration.) One of the recommendations is important to us here, and it has few (maybe not any) critics.

The commission recommended that before graduating from high school, students be required to take one-half year of computer science. Now comes the problem. Exactly *what* should be taught during that half year? What types of things would satisfy the needs of the proficient programmer, the uninterested girl, and the fun user—all at the same time? Obviously, no single semester course will be adequate.

Most schools have an introductory course about computers, with an end goal of producing a program This is unwise, and will not address the needs of many students.

(Michael Plog received his Ph.D. degree from the University of Illinois, the M.S. from Memphis State University, and the B.S. from the University of Tennessee. For his foreign/research language option required for the doctorate, he naturally selected computer language. Michael currently works for the Illinois State Board of Education as a research and evaluation specialist.)

After all, how many programmers does a society need? Would our culture be any stronger if everyone knew how to write a simple BASIC program? So, there is no reason to have all our students become programmers. It is not only silly, it is a waste of human resources. Some people are developers of programs, some users. Just because many people travel by automobile does not mean we should expect all our students to know how to rebuild an engine. Simply because we live in houses does not mean everyone should be a carpenter before allowed full adult status.

We should recognize that schools have to meet different needs of different students. The needs of the proficient programmer noted above are not necessarily any greater than the needs of other students in our educational institutions.

The major thing to learn about computers is that they can perform tasks. The specific tasks to be performed are varied. We should not present all students with the same learning experiences, because they will not all need to know the same things.

The girl mentioned above is a good example. Our educational institutions should provide for her needs as well as for the proficient programmer. One of her needs may be to simply understand the types of things a microcomputer can do, and the things it cannot.

It is reasonable to expect that high school graduates in the next few years will be computer literate. But what does—and should—that mean? All students should know the power of computers, how microcomputers impact on their lives, and how to follow written instructions in order to get a program to work.

But, the concept of computer literacy is more: it is as much an attitude and appreciation of the power our electronic slaves as it is the acquisition of knowledge.

Owners of Color Computers can probably appreciate the power of our electronic slaves better than owners of other machines. Many of you are probably like me. I purchased a Color Computer because I wanted a micro of my own, but did not want to pay the outrageous price of other machines, like the Model III. After working with my computer, then others, my sense of awe and appreciation for the Color Computer grew.

It is easy, but dangerous, to forget that literacy about computers is not necessarily an end in itself—it is a way to get to many ends.

This may be the real challenge of computer instruction in our schools. During the next few years, we will see many attempts to define computer literacy in functional terms. I expect that some companies will provide curriculum guides for computer studies from kindergarten through high school. There will be a growth in "snake oil" salesmen: those individuals interested in producing a profit, yet not too concerned with educational experiences.

The future of computers in education sounds exciting. We have a choice of approaches. Instead of blundering ahead with the incorrect assumption that all students should be exposed to the same experiences, I suggest we should try to develop a more realistic understanding of the needs of our students.

If you have comments, arguments, or suggestions, I would like to hear from you. My address is 829 Evergreen, Chatham, Ill., 62629. By the way, when I discussed the three students in this article, I left out the most important student—*you*. Your schooling may end, but never your education. Until next month.

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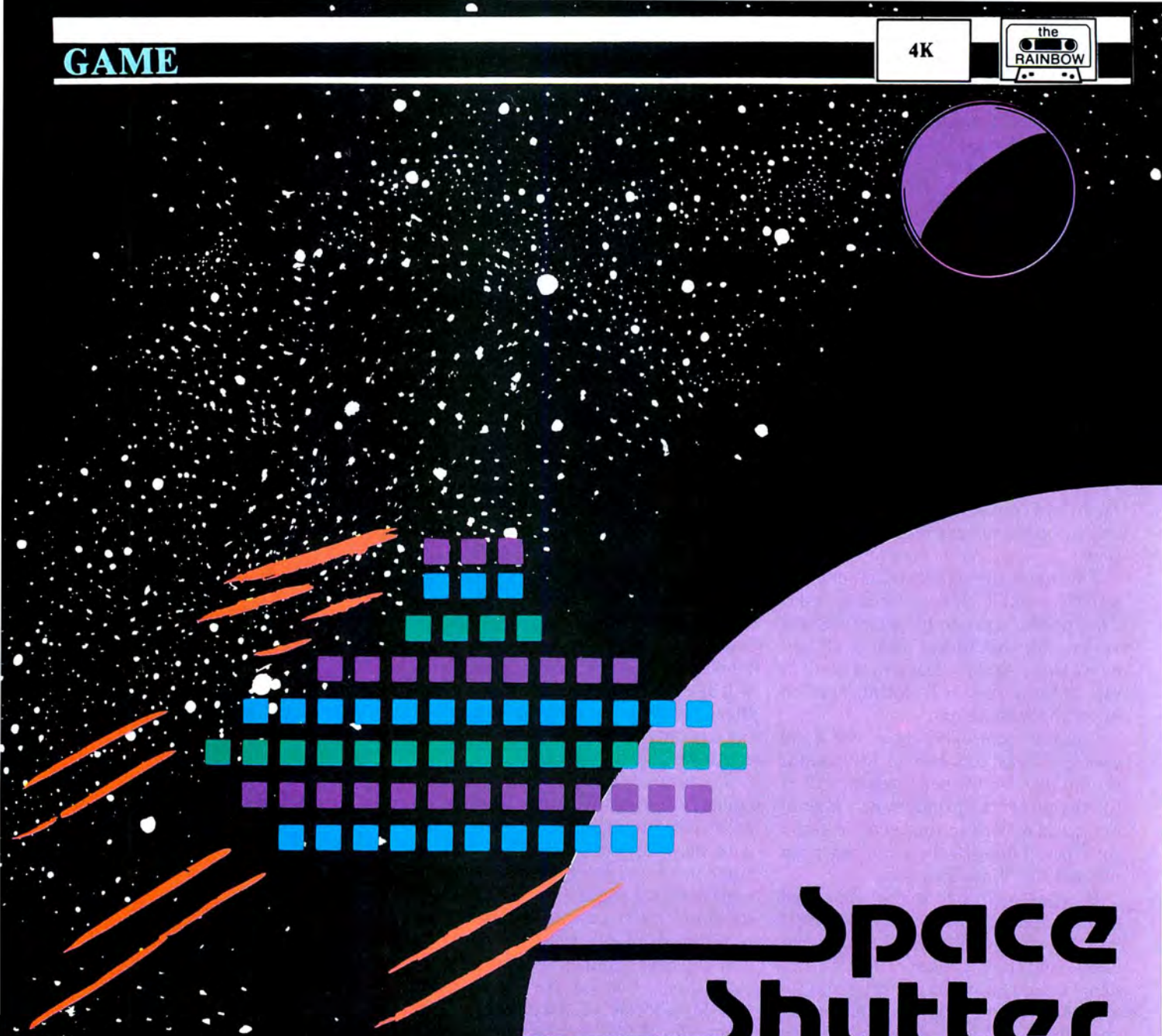
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Space Shutter

About two months after I got my Color Computer I finally got around to the graphics side of things. My objective in my first graphics program was to create a non-violent game which the younger members of my family could enjoy while still challenging the older arcade game fans. In this respect I am quite pleased with the results.

In *Shutter Bug*, a UFO appears and darts about the screen in a random pattern. The player must attempt to frame the UFO in the camera's viewfinder, using the right joystick, and take a picture of it by pressing the joystick button. The game score, the number of exposures remaining in the camera and the high score for the level being played at are displayed across the bottom of the screen.

By Jim Griffin

(Jim Griffin, employed in the data processing field for 17 years, is currently the Chief of Computer Systems Services for Public Archives Canada. He is currently using his Color Computer to automate a 5000 record data base on tape for the Ottawa Cursillo Movement.)

The game plays at three different levels: novice, buff and pro. At the novice level the UFO varies speeds within a moderate range and may traverse the full screen without changing direction, allowing younger players a better chance to get a good picture. At the higher levels of play the time limit of the game is reduced, the distance the UFO may travel without setting a new course is reduced and the range of possible speeds is increased. In order to make the game more interesting the UFO is given a variable head start after a picture is taken and you are presumably advancing your film. Assuming that when UFOs make abrupt changes in direction they would do so by executing an edge wheel it follows that they may be virtually invisible for an instant. When this happens the program will not allow a picture to be taken, to spare the player the embarrassment of taking a picture of nothing, of course.

Since my Color Computer was my introduction to BASIC and I had no knowledge of 6809 assembly language programming I assumed that I would be able to develop an arcade style game solely in BASIC. In this respect the initial version of the game was a major disappointment. From the time the picture was taken until the time the score was calculated and posted, the remaining exposures were calculated and posted and the UFO was underway again, a full seven seconds had elapsed. I couldn't believe that this was the best that could be expected. Two months of work to refine the program yielded *Shutter Bug* (Listing 1) and a number of insights that I would like to share, especially with novice programmers who are not prepared to begin learning assembly language programming yet. A list of the major variables used in the program has been provided (Table 1) to assist readers in analyzing the program.

The first thing to contend with in graphics programs is the excessive amount of memory used by graphics arrays formatted as suggested in the *Getting Started With Color BASIC* manual. As a number of articles have been written on the sizing of graphics arrays I won't deal with this topic in-depth, but would suggest that novice programmers who have not read these articles examine the *DIM* statement in line 20 and the *GET* statements associated with each array.

The problem of scoring is a little more complex. *Shutter Bug* falls into the "hunter-victim" class of programs along with the familiar shoot-em-up variety. Generally speaking, shoot-em-up programs can utilize the PPOINT instruction to determine the presence or absence of a given color at or in a limited predescribed pattern around a set of coordinates equating to the joystick position and in so doing determine a score. The potential area within which a score may be realized in *Shutter Bug,* the area within the viewfinder, is significantly more extensive and therefore demands a different approach to scoring. The PPOINT scan used in the initial version accounted for a major portion of the seven second delay.

The objective of the scoring routine was to award one point for each pixel of the UFO found within the viewfinder, a maximum of 246, and a bonus of four points for a perfect picture. The irregular shape of the UFO presented special problems. Figure 1 shows the UFO, as seen by the computer for scoring purposes, and the viewfinder in a "perfect picture" relationship to it. It can easily be seen that if the viewfinder were moved up three lines the score would be different to what it would be if the viewfinder were moved down three lines. Therefore, it was necessary to know the specific relationship of the viewfinder to the UFO. The program accomplishes this in lines 620—630 by ascertaining the horizontal and vertical penetration of the viewfinder into the area occupied by the UFO. Since there were only 19 points of possible horizontal coincidence and nine points of possible vertical coincidence between the viewfinder and the UFO, it was practical to use the horizontal and vertical penetration factors as subscripts applicable to a table of valid scores (lines 640 and 70—150). Thus the task of scoring became a matter of mathematics rather than the slower PPOINT scan.

The second factor in the seven second delay was getting the score and exposure counters updated and onto the screen. The original "blank and redraw" strategy was too time consuming. Using the single *PUT* statement in line 800 for all digits proved much faster. The digits 0 through 9 were saved in the variables N0 through N9 (line 20) while the title screen was in preparation (lines 1070—1220), leaving no trace on the title screen when it appeared (line 50). The fact that this was accomplished with a single *GET* statement (line 1220) was made possible by the use of a technique which, when using an interpreter, might be described as "instruction modification." The trick is set up in line 40 and the subroutine beginning at line 1460. Based on the parameters in line 40 the subroutine searches out and stores in MA(1) the address where the "9" of the variable N9 is stored in the *GET* statement (line 1220). When line 1220 is executed the *POKE* statement preceding the *GET* modifies the name of recipient graphics array in the *GET* statement, making it N0 the first time it is executed, N1 the second time and so on until it becomes N9 the final time. The fact that the *GET* statement is specifying a different array (variable) each time it is executed (N0 through N9) is of no consequence to the interpreter as long as the array has been described in a *DIM* statement (line 20).

"Instruction modification has been used in this program to effectively simulate the subscripting of graphic arrays. The uses to which the technique may be put are not limited to this one application."

The same technique as used again in line 60 and the subroutine beginning in line 1460. This time the subroutine stores in MA(2) the address where 0 of the variable N0 is stored in the *PUT* statement in line 800. The *POKE* statement in line 790 modifies the name of the array to be *PUT* by line 800 to N0 through N9 depending on the digit to be displayed on the screen. Thus a single *PUT* statement was used to display all the counts across the bottom of the screen. In addition to reducing the number of instructions which the interpreter must handle and therefore saving time, this technique has the benefit of saving precious memory by reducing the number of *GET* and *PUT* statements in the program.

There is one essential difference between the *GET* statement in line 1220 and the *PUT* statement in line 800. If the BREAK key is pressed at any time other than when the title screen is being prepared, line 1220 will appear as it does in Listing 1. This is not the case with the *PUT* statement in line 800 however, since the array name will coincide with the last

digit which was displayed at the bottom of the screen. If the player enters *RUN* after the BREAK key has been pressed, the program may not be able to find the modifiable address (MA) by virtue of the variable name not being in its original state. Line 960 protects against this occurrence in the event of a normal end condition; however, if the game is rerun after the BREAK key has been pressed, lines 1220 and 800 should be examined to ensure that they are in their original condition or the program should be reloaded.

Instruction modification has been used in this program to effectively simulate the subscripting of graphic arrays. The uses to which the technique may be put are not limited to this one application. I have also used it in a hangman game, among others, where it replaces an *ON* X *GOTO* and a string of *GETs* and *PUTs*. I leave it to your imaginations to envisage other uses.

The primary question about using the technique is: Where do I start the search for the modifiable address? Code the variable name to be modified with a unique name, such as QQ, set the variable Y (line 40 in *Shutter Bug*) to a sufficiently small number (1536 will do if you have no idea at all where the statement might be) and raise the upper limit of the search (line 1480 in *Shutter Bug*) to the upper limits of your computer's RAM (16383 for 16K owners, 32767 for 32K owners). The values *PEEKed* at in X and X+1 must, of course, be the decimal equivalents of the letters used to identify the variable whose name you are going to modify. Put an end statement immediately following the *GOSUB* statement used to initiate the search and *RUN* the program. When the program ends, type ?X or PRINT X and press ENTER. The number that is returned is the address where the first letter of the two-lettered variable is located. Now the search can be restructured as in *Shutter Bug* using some unique variable name which you might prefer to QQ, starting the search some reasonable distance prior to the address returned by the initial serach. Remember that as you add, change and delete statements in your program, the location of the modifiable address will also change, so the spread of addresses to be searched (line 1480 in *Shutter Bug*) should be wider during development than in the completed product. In *Shutter Bug* the difference between the value of Y in line 60 and the actual location of the modifiable address (MA(2)) effectively controls the length of time that the title screen is held.

I hope that you enjoy *Shutter Bug* and find many new uses for these techniques.

```
120 ..... 025A
260 ..... 0472
560 .... 07BA
810 .... 0AA1
1000 .... 0E0C
1170 ..... 1176
1330 .....144C
END ..... 1752
```

The listing:

```
10 GT$="SHUTTER BUG"
20 DIM U(1,23),BC(1),YC(1),PT(9,
19),N0(1),N1(1),N2(1),N3(1),N4(1
),N5(1),N6(1),N7(1),N8(1),N9(1)
30 POKE 65495,0:CLS:PMODE 3,1:SC
REEN 1,0:GOSUB1020
40 Y=12365:Z=57:C=1:GOSUB1460
50 GOSUB1070
60 Y=10200:Z=48:C=2:GOSUB1460
70 DATA 0,0,0,0,6,12,12,12,12,12
,12,12,12,12,6,0,0,0,0
80 DATA 0,0,0,3,20,37,40,40,40,4
0,40,40,40,37,20,3,0,0,0
90 DATA 0,3,10,21,46,71,82,89,92
,92,92,89,82,71,46,21,10,3,0
100 DATA 3,18,37,60,97,134,157,1
76,191,194,191,176,157,134,97,60
,37,18,3
110 DATA 3,21,47,78,123,168,199,
225,243,250,243,225,199,168,123,
78,47,21,3
120 DATA 3,21,47,78,117,156,187,
213,231,234,231,213,187,156,117,
78,47,21,3
130 DATA 3,21,47,75,103,131,159,
185,203,206,203,185,159,131,103,
75,47,21,3
140 DATA 3,18,37,57,77,97,117,13
6,151,154,151,136,117,97,77,57,3
7,18,3
150 DATA 0,3,10,18,26,34,42,49,5
2,52,52,49,42,34,26,18,10,3,0
160 FORY=1TO9:FORX=1TO19:READZ:P
T(Y,X)=Z:NEXTX,Y
170 HS=0:H1=0:H2=0:H3=0
180 GOSUB1240
190 ' START GAME
200 GOSUB1020:GOSUB1350
210 S(1)=89:S(2)=176:S(3)=218:T=
1:C=0:E=0
```


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```
220 H$="BM":J$="50":I$=",":K$="5
0":JK$=H$+J$+I$+K$
230 ' CREATE BACKGROUND
240 PCLS(3):DRAW"C4;BM0,182;R255
":PAINT(0,191),4,4
250 DRAW"C3;BM100,182;D9;L1;U9;L
1;D9;BM154,182;D9;R1;U9;R1;D9"
260 GOSUB690
270 ' BRING ON UFO
280 X=(RND(24)*8)+6: Y=2
290 CIRCLE(X+26,Y+18),20,4,.25:
PAINT(X+26,Y+15),2,4
300 CIRCLE(X+26,Y+14),8,4,1,.5,1
: PAINT(X+26,Y+9),2,4
310 GET(X,Y)-(X+56,Y+29),U: TIME
R=0
320 ' SELECT UFO DIRECTION
330 DX=(RND(24)*8)+6:DY=(RND(24)
*6)+2:MD=RND(20*DD)
340 IFDD<2 THEN MD=MD+40:GOTO440
350 IFDX>X THEN380
360 Z=X-DX:IFZ>100 THEN DX=DX+48
370 GOTO390
380 Z=DX-X:IFZ>100 THEN DX=DX-48
390 IFDY>Y THEN420
400 Z=Y-DY:IFZ>70 THEN DY=DY+36
410 GOTO440
420 Z=DY-Y:IFZ>70 THEN DY=DY-36
430 ' MOVE UFO
440 IFX=DX THEN460
450 IFX<DX THEN X=X+8 ELSE X=X-8
460 IFY=DY THEN480
470 IFY<DY THEN Y=Y+6 ELSE Y=Y-6
480 PUT(X,Y)-(X+56,Y+29),U:Z=RND
(3):SOUNDS(Z),T:FORZ=1TOMD:NEXTZ
490 IFX=DX AND Y=DY THEN330
500 IFSH>0 THEN SH=0:GOTO440
510 ' CREATE VIEWFINDER
520 DRAWJK$:DRAW"C3;L4;D3;BM+0,+
10;D3;R4;BM+32,+0;R4;U3;BM+0,-10
;U3;L4"
530 POKE 65494,0:J=JOYSTK(0):K=J
OYSTK(1):POKE 65495,0
540 IFJ<2 THEN J=2 ELSE IFJ>53 T
HEN J=53
550 IFK<2 THEN K=2 ELSE IFK>53 T
HEN J=53
560 JA=J*4:KA=K*3
570 J$=STR$(JA):K$=STR$(KA):JK$=
H$+J$+I$+K$
580 DRAWJK$:DRAW"C2;L4;D3;BM+0,+
10;D3;R4;BM+32,+0;R4;U3;BM+0,-10
;U3;L4"
590 IFTIMER>TT THEN830
600 P=PEEK(65280):IFP=126ORP=254
THEN620ELSEGOTO440
610 ' ANALYZE PICTURE
620 E=E+1:HP=(JA+30-X)/4: IFHP<1
```




```
 OR HP>19 THEN650
630 VP=(KA+8-Y)/3: IFVP<1 OR VP>
9 THEN650
640 C=C+PT(VP,HP):SH=RND(2)-1
650 GOSUB700
660 IFE=20THEN830
670 P=PEEK(65280):IFP=126ORP=254
THEN670ELSEGOTO330
680 ' DISPLAY COUNTERS
690 M=HS:P1=176:P2=224:P3=160:GO
SUB730
700 M=C:P1=24:P2=72:P3=8:GOSUB73
0
710 Z=RND(3): SOUNDS(Z),T
720 M=20-E:P1=112:P2=128:P3=64:G
OSUB730:RETURN
730 M1(1)=INT(M/1000)
740 M1(2)=INT(M/100)-M1(1)*10
750 M1(3)=INT(M/10)-(M1(1)*100+M
1(2)*10)
760 M1(4)=M-(M1(1)*1000+M1(2)*10
0+M1(3)*10)
770 FORZ=P1 TOP2 STEP16
780 M2=(Z-P3)/16:M3=M1(M2)
790 POKE MA(2),48+M3
800 PUT(Z,182)-(Z+7,189),N0
810 NEXTZ:RETURN
820 ' END ROUTINE
830 DRAWJK$:DRAW"C3;L4;D3;BM+0,+
10;D3;R4;BM+32,+0;R4;U3;BM+0,-10
;U3;L4"
840 IFY<3THEN850ELSEY=Y-6:PUT(X,
Y)-(X+56,Y+29),U:GOTO840
850 FORZ=1TO6:GET(X,6)-(X+56,35)
,U:PUT(X,0)-(X+56,29),U:NEXTZ
860 DRAW"C2;BM30,80;U6;R6;D6;U3;
L6;BM+18,+3;U6;F6;U6;BM+12,+0;D6
;R6;U6;L6;BM+17,+0;R7;L3;D6;BM+1
5,+0;U6;D3;R6;D3;U6"
870 DRAW"BM+18,+0;L6;D3;R4;L4;D3
;R6;BM+12,+0;U6;R6;D3;L6;R3;F3;B
M+30,-6;L6;D6;R6;U3;R2;L4;"
880 DRAW"BM+12,+3;U6;R6;D6;U3;L6
;BM+16,+3;U6;F4;E4;D6;BM+16,+0;L
6;U3;R4;L4;U3;R6"
890 DRAW"BM33,100;U2;H4;F4;E4;BM
+18,+0;L6;D3;R4;L4;D3;R6;BM+18,-
6;L6;D3;R6;D3;L6"
900 DRAW"BM201,100;U6;F6;U6;BM+1
2,+0;D6;R6;U6;L6"
910 FORZ=1TO500:NEXTZ:POKE 65494
,0:GET(48,120)-(55,129),BC
920 J=JOYSTK(0):IFJ>31THENCX=208
ELSECX=48
930 PUT(CX,120)-(CX+5,125),YC:FO
RZ=1TO50:NEXTZ:PUT(CX,120)-(CX+7
,129),BC
940 P=PEEK(65280):IFP=126ORP=254
THEN960
950 GOTO920
960 IFJ>31THEN POKE MA(2),48:PCL
S:CLS:END
970 IFC<HS+1THEN200
980 IFDD=1THENH1=C:GOTO190
990 IFDD=2THENH2=C ELSEH3=C
1000 GOTO200
1010 ' DRAW LOGO
1020 PCLS(4):DRAW"C2;BM126,20;L6
0;D74;R60;U28;D27;L59;U72;R59;BM
-22,+38;R80;D52;L40;D1;R41;U54;L
81;BM+36,+7;D80"
1030 DRAW"BM126,23;L56;D68;R52;U
25;D24;L51;U66;R55;BM-22,+38;R76
;D46;L36;D1;R37;U48;L77;BM+32,+4
;D80"
1040 DRAW"BM126,26;L52;D62;R44;U
22;D21;L43;U60;R51;BM-22,+38;R72
;D40;L32;D1;R33;U42;L73;BM+28,+1
;D80"
1050 GET(12,12)-(19,19),BC:RETUR
N
1060 ' GAME TITLE
1070 DRAW"C2;BM42,165;L6;D3;R6;D
3;L6;BR18;U6;D3;R6;D3;U6;BR12;D6
;R6;U6;BR11;R7;L3;D6;BR17;U6;L4;
R8;BR17;L6;D3;R4;L4;D3;R6;BR12;U
6;R6;D3;L6;R3;F3"
1080 DRAW"BR22;R7;E1;U1;H1;L5;R5
;E1;U1;H1;L7;R2;D6;U6;BR17;D6;R6
;U6;BR18;L6;D6;R6;U3;L2;R4"
1090 C=0
1100 DRAW"C2;BM8,13;D6;R7;U6;L7"
:GOSUB1220
1110 DRAW"BM12,13;D6":GOSUB1220
1120 DRAW"BM8,14;U1;R7;D3;L7;D3;
R7":GOSUB1220
1130 DRAW"BM8,13;R7;D3;L4;R4;D3;
L7":GOSUB1220
1140 DRAW"BM8,13;D3;R7;U3;D6":GO
SUB1220
1150 DRAW"BM15,13;L7;D3;R7;D3;L7
":GOSUB1220
1160 DRAW"BM14,13;L6;D6;R6;U3;L7
":GOSUB1220
1170 DRAW"BM8,13;R7;D6":GOSUB122
0
1180 DRAW"BM8,13;D6;R7;U6;L7;D3;
R7":GOSUB1220
1190 DRAW"BM8,19;R7;U6;L7;D3;R7"
:GOSUB1220
1200 DRAW"C3;BM20,20;U20;D20;L20
":PAINT(19,19),2,3:GET(12,12)-(1
9,19),YC
1210 PAINT(19,19),4,3:DRAW"C4;BM
20,20;U20;D20;L20":RETURN
1220 POKE MA(1),C+48:GET(12,12)-
(19,19),N9:PUT(12,12)-(19,19),BC
:C=C+1:RETURN
```

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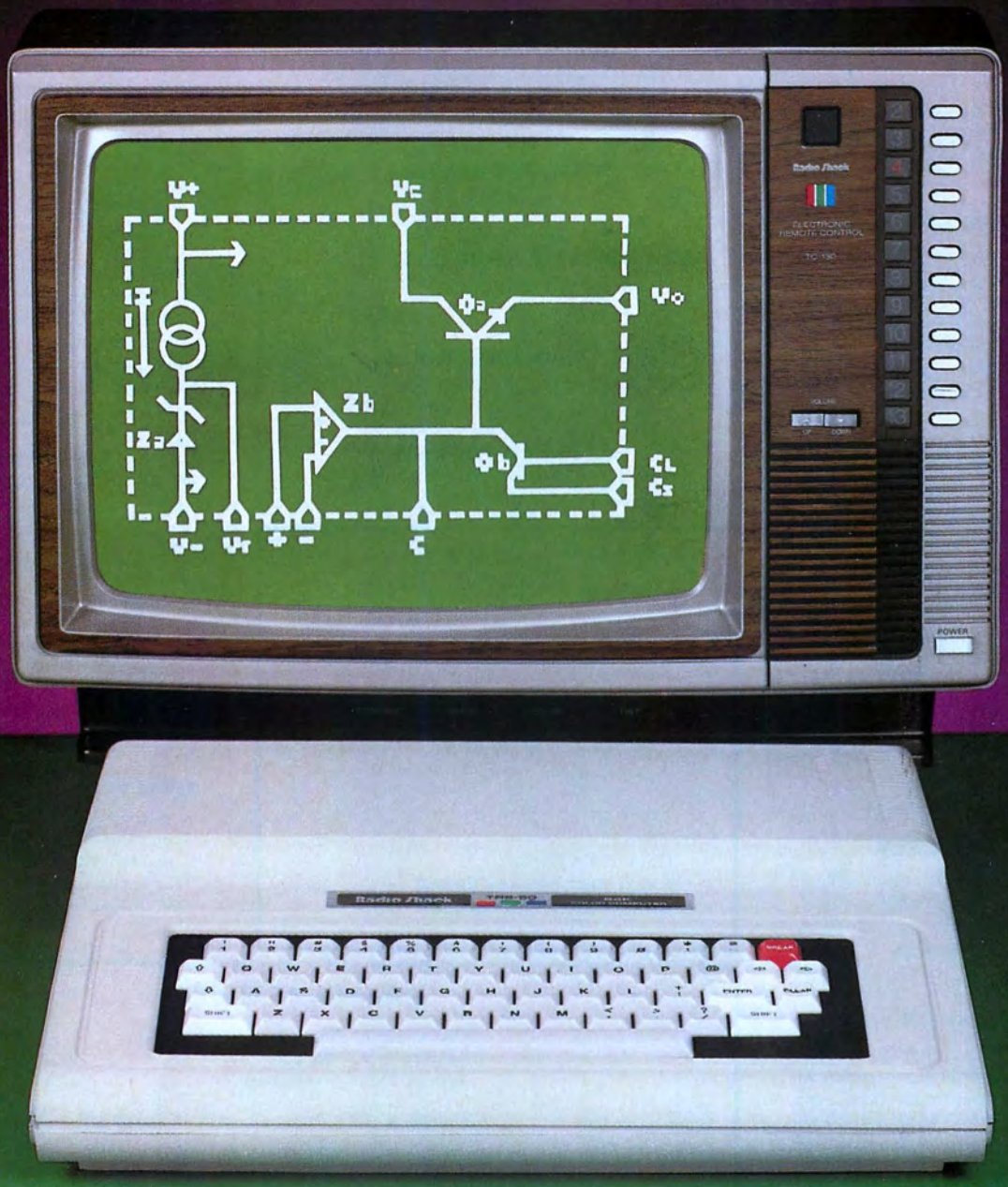
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```
1230 ' INSTRUCTIONS
1240 PCLS:CLS:PRINT@11,GT$
1250 PRINT:PRINT" IT'S A LOVELY
DAY FOR A STROLL. YOU'RE WALKING
 ALONG WITH YOUR  CAMERA OVER YO
UR SHOULDER WHEN  SUDDENLY A UFO
 APPEARS."
1260 PRINT:PRINT" YOU HAVE 20 PI
CTURES IN YOUR    CAMERA, AND WH
O KNOWS HOW LONG  THE UFO WILL B
E THERE. TRY TO   GET AS MANY PI
CTURES AS YOU     CAN."
1270 PRINT:PRINT" GOOD LUCK!"
1280 PRINT@480,"(PUSH JOYSTICK B
UTTON TO START)";
1290 P=PEEK(65280)
1300 IFP=126ORP=254THEN1320
1310 GOTO1290
1320 PMODE3,1:PCLS:SCREEN1,0
1330 P=PEEK(65280):IFP=126ORP=25
4THEN1330ELSERETURN
1340 ' DEGREE OF DIFFICULTY
1350 DRAW"BM20,170;U6;F6;U6;BM+6
,+0;D6;R6;U6;L6;BM+12,+0;D2;R2;D
2;R1;D2;R2;U2;R1;U2;R2;U2;BM+9,+
0;D6;BM+15,+0;L6;U6;R6;BM+12,+0;
L6;D3;R4;L4;D3;R6"
1360 DRAW"BM128,170;U6;R6;D3;L6;
R6;D3;L6;BM+12,-6;D6;R6;U6;BM+12
,+0;L6;D3;R4;L4;D3;BM+12,+0;U3;R
4;L4;U3;R6"
1370 DRAW"BM203,170;U6;R6;D3;L6;
BM+12,+3;U6;R6;D3;L6;R3;F3;BM+6,
+0;R6;U6;L6;D6"
1380 POKE 65494,0:J=JOYSTK(0):IF
J>41THENCX=216:GOTO1400
1390 IFJ>21THENCX=144ELSECX=48
1400 PUT(CX,180)-(CX+5,185),YC:F
ORZ=1TO50:NEXTZ:PUT(CX,180)-(CX+
7,185),BC
1410 P=PEEK(65280):IFP=126ORP=25
4THEN1420ELSEGOTO1380
1420 POKE 65495,0:IFJ>41THENTT=2
200:HS=H3:DD=3:RETURN
1430 IFJ>21THENTT=3300:HS=H2:DD=
2:RETURN
1440 TT=4400:HS=H1:DD=1:RETURN
1450 'IDENTIFY ADDRESSES FOR MOD
IFICATION
1460 X=Y
1470 IF PEEK(X)=78 AND PEEK(X+1)
=Z THEN MA(C)=X+1:GOTO1490
1480 IF X=Y+300 THEN PRINT"MA"C"
NOT FOUND":END ELSE X=X+1:GOTO 1
470
1490 RETURN
```


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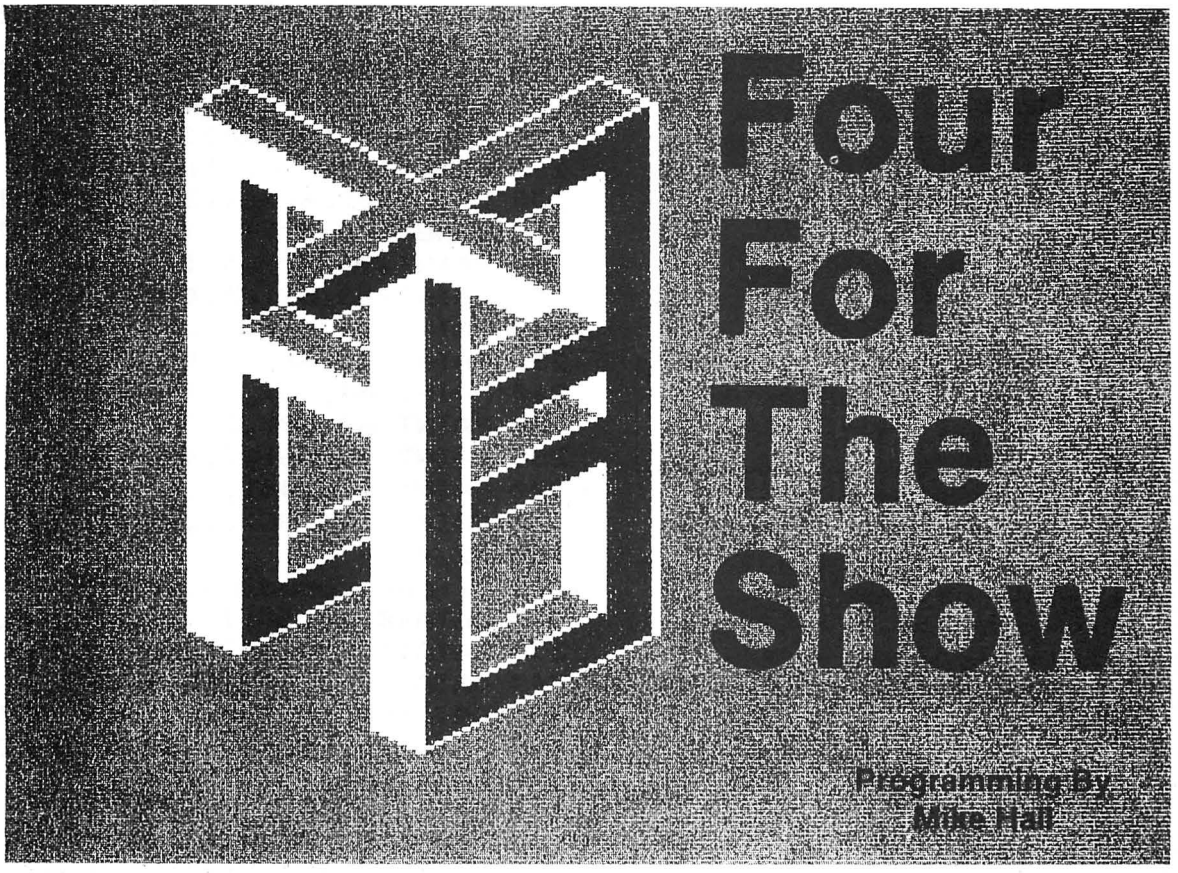
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Raindrop — A *PCLEAR 8* must be executed before running this program. It produces a raindrop falling on calm water effect. This is a neat example of using all eight graphic pages to make animation. By deleting line 110, the graphics are greatly speeded up, and an eye-boggling effect is created.

Quaddraw — This program requires the right joystick. By moving the joystick lever, you create a line which will move in eight different directions. The line you make is symmetrically copied while you draw it, so it looks like you are drawing four different lines. Some very interesting pictures can be made with this program.

Illusion — This uses coordinates stored in *DATA* lines to produce a very interesting optical illusion.

Twirler — This uses the *CIRCLE* command with variable parameters, and four colors in *PMODE 4* to create a neat little graphics effect.

Listing 1:

```
5 'RAINDROP
6 'BY MIKE HALL
7 '3019 SYLVESTER DRIVE
8 'HARTLAND, WI 53029
9 'DELETE LINE 110 FOR A REALLY
NEAT EFFECT!
10 PCLEAR8
20 FORX=1TO8:PMODE0,X:PCLS:NEXTX
30 CLS:PRINT"PLEASE WAIT WHILE T
HE raindrop  IS CREATED"
40 FORX=1TO8:PMODE0,X
50 FORY=X*2TO180 STEP16
60 CIRCLE(128,96),Y
70 NEXTY:T=RND(255)
80 PLAY"T"+STR$(T)+";ABC"
90 NEXTX
100 FORX=1TO8:PMODE0,X:SCREEN1,1
110 FORZ=1TO30:NEXTZ
120 NEXTX
130 GOTO100
```

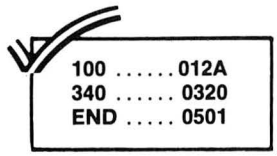
(Mike Hall is a high school junior in Hartland, Wisconsin. He is a self-taught programmer who actively participates in the Milwaukee Area Color Computer Users' Group, the CoCo-MUGS.)

Listing 2:

```
5 'QUADDRAW
6 'BY MIKE HALL
7 '3019 SYLVESTER DRIVE
8 'HARTLAND, WI 53029
10 PMODE4,1:PCLS:SCREEN1,1
20 X=128:Y=96
30 J=JOYSTK(0):K=JOYSTK(1)
```

```
40 IFJ=0 THENX=X-1
50 IFJ=63 THENX=X+1
60 IFK=0 THENY=Y-1
70 IFK=63 THENY=Y+1
80 IFX<0 THENX=255
90 IFX>255 THENX=0
100 IFY<0 THENY=191
110 IFY>191 THENY=0
120 PSET(X,Y,1)
130 PSET(X,191-Y,1)
140 PSET(255-X,191-Y,1)
150 PSET(255-X,Y,1)
160 GOTO30
```

Listing 3:




```
5 'OPTICAL ILLUSION
6 'BY MIKE HALL
7 '3019 SYLVESTER DRIVE
8 'HARTLAND, WI 53029
10 PMODE3,1:PCLS:SCREEN1,0
20 LINE(50,144)-(40,139),PSET
30 FORZ=1TO21:READX,Y
40 LINE-(X,Y),PSET:NEXT
50 LINE(81,128)-(50,144),PSET
60 LINE(50,144)-(50,81),PSET
70 FORZ=1TO7:READX,Y
80 LINE-(X,Y),PSET:NEXT
90 LINE(90,60)-(90,165),PSET
100 LINE(40,24)-(81,45),PSET
110 FORZ=1TO15:READX,Y
120 LINE-(X,Y),PSET:NEXT
130 LINE(100,108)-(131,92),PSET
140 LINE-(131,83),PSET
150 LINE-(100,99),PSET
160 LINE(131,92)-(123,87),PSET
170 LINE(141,24)-(101,46),PSET
180 FORZ=1TO10:READX,Y
190 LINE-(X,Y),PSET:NEXT
200 LINE(122,67)-(122,44),PSET
210 LINE(110,50)-(122,57),PSET
220 PAINT(96,72),3,4
230 PAINT(56,52),3,4
240 PAINT(56,132),3,4
250 PAINT(76,64),3,4
260 PAINT(44,76),2,4
270 PAINT(84,68),2,4
280 PAINT(92,56),2,4
290 PAINT(128,44),2,4
300 PAINT(128,88),2,4:PAINT(128,
108),2,4
310 'first coordinates
320 DATA40,24,50,18,91,40,131,18
330 DATA142,24,142,140,90,166
340 DATA81,161,81,65,90,60
350 DATA100,64,100,151,131,135
360 DATA131,103,122,107,122,130
370 DATA100,142,122,130,131,134
380 DATA131,103,100,118
390 'second coordinates
400 DATA81,97,81,118,60,128
410 DATA60,119,81,108,60,119
420 DATA60,86
430 'third coordinates
440 DATA60,56,60,44,72,50,50,38
450 DATA50,72,60,67,60,56,60,67
460 DATA90,50,90,60,69,72,60,67
470 DATA81,78,81,87,50,72
480 'fourth coordinates
490 DATA110,50,131,39,131,72
500 DATA100,88,100,64,114,71
510 DATA100,79,122,67,131,72
520 DATA90,50
530 FORX=1TO999:NEXT
540 PMODE4,1:SCREEN1,1
550 GOTO550
```

Listing 4:

```
5 'TWIRLER
6 'BY MIKE HALL
7 '3019 SYLVESTER DRIVE
8 'HARTLAND, WI 53029
10 PMODE4,1:PCLS:SCREEN1,1:PMODE
3,1
20 LINE(0,0)-(255,191),PSET
30 LINE(255,0)-(0,191),PSET
40 S=RND(100)/100:E=RND(100)/100
50 R=RND(100):C=RND(4)
60 CIRCLE(128,96),R,C,1,S,E
70 GOTO40
```


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The Simplicity of Sinelines



Program By
Norm Cutter

Among the many pleasures of showing off your computer is that of demonstrating how a very simple listing can sometimes produce spectacular results. *Sinelines* is just such a program quickie. Norm Cutter, of Aptos, California, writes us to say, "I would like to see many more short and interesting programs in your magazine. Copying those huge two to three page programs is a real chore." Along with his letter he enclosed a "very brief program which your readers can type up in minutes."

Well, we totally agree with Norm and, for offering to share his creation with all of us, we've selected him as this month's winner of the Roy G. Biv Award. Congratulations, Norm!

Norm suggests that once you're ready to run *Sinelines*, cue up a recording of Elton John's "Carla Etude" for a mood music accompaniment. But, perhaps you have your own "right" music. If you want the graphics to move a bit faster or slower, to match your preferred beat, then change the S variable in line 61 to, say, .05 for slower music. Experiment.

The listing:

```
10 REM**SINLINES, BY NORM CUTTER
20 PCLS:PMODE 4,1:SCREEN 1,1
60 B=B+I
61 S=S+.1
70 D=D+Q
80 IF B>250 THEN PCLS:I=-2
90 IF D>180 THEN Q=-2
92 IF D<5 THEN Q=2
93 IF B<5 THEN I=2
96 X=(SIN(S)*129)+129
100 LINE (X,D)-(D,B),PSET
150 GOTO60
```

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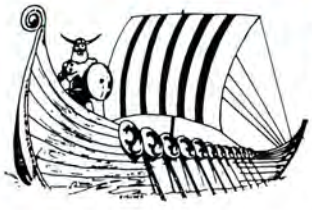


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B & ML This program is written mostly in BASIC, but some routines are in machine language for more speed. May be harder to examine or modify than an all BASIC program.

100% ML This program is all machine language for fastest possible execution. Examination or modification will require a high skill level.

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Machine Language Cassette I/O

By Roger Schrag

In the July issue of *the Rainbow* I presented a program that aided machine language programmers in doing Input/Output operations with disk drives. This month I would like to present a program that offers similar capabilities for cassette users.

In the back pages of the Color BASIC and Extended Color BASIC manuals is a list of some routines contained within the BASIC ROM that machine language programmers may use. Four of these routines pertain to cassette operation, allowing you to load and dump blocks of memory to and from tape rather easily.

However, these routines don't offer the flexibility and power you might like. When it comes to performing complex operations, such as handling a cassette data file, these ROM routines will do very little of the work; you must write some very involved routines of your own to get the job done.

What I will present here is a block of source code that you may append to any program you write. This appendage contains nine powerful routines that your programs may all call upon as you wish. These nine routines are named Open, Close, Print, Input, Skipf, Cloadm, Csavem, Motor, and Audio. Each routine performs an operation similar to that of the BASIC statement the title reflects. For example, the Skipf routine allows you to skip over a file on the cassette. Please have a thorough understanding of how these nine BASIC statements work before atempting to use the routines.

Each of the nine routines requires that you first prepare the registers with necessary information. To use the Cloadm routine, for example, you must provide a filename and a load offset. Now let's take a look at each of the routines and how you may use them.

The first routine is Open. It allows you to open a tape file for either input or output. Before calling this routine, you must prepare the X, A, and B registers. Load the X register with the address of where in memory the filename is stored. Place a zero or $0D (ASCII code for a carriage return) after the last character of the name so that the Open routine can calculate how long the name is. If you are opening a file in the input mode and would like the computer to simply use the first program it encounters on the tape, then point the X register directly at a zero or $0D.

Next you must load the A register with the file mode. To open the file for input load A with the value $49, the ASCII code for I. To open the file for output load A with the value $4F, the ASCII code for O. Finally, you must load B with the display status. The display status is irrelevant if you are opening the file in the output mode, but makes a difference for the input mode. If you load B with $FF, the computer will clear the screen and show an S in the upper corner. It will then display filenames as they come up, and blink an F as the data file is read. If you don't want all of this information printed on the screen, then load the B register with a zero. This way the computer will not affect the screen in any way.

This example will open the next file encountered on the cassette for input mode. The filename will automatically be printed on the screen, and an F will blink as the data file is read:

```
        LDX     #NONAME     Load X with the address
                            of the name
        LDA     #$49        Open file in the input
                            mode
        LDB     #$FF        We want the on-screen
                            information
        JSR     OPEN        Open the file
        BRA     MORE        Program continues . . .
NONAME  FCB     $0          Use next file encountered
                            on the tape
```

The second routine is Close. It closes the cassette file if it is open. It does not require any register preparation. This example will close the cassette file:

```
        JSR     CLOSE       Close the cassette file
```

The third routine is Print, and it is used to write to a cassette file opened in the output mode. This routine differs from the BASIC statement Print#-1 in that you may only write one character at a time. A small loop is necessary to write a complete message or block of data. To use this routine you must load the ASCII code of the character you wish to write to the file into the A register. The routine will handle the rest.

This example will write the data "PLASTIC SPOONS: 360 DOZEN" to the tape file:

```
        LDX     #DATA       Point X at start of data
LOOP    LDA     ,X+         Read a character of data
```

(Roger Schrag, currently studying computer science at the University of California at Berkeley, enjoys working with the CoCo and writing articles for ***the Rainbow.*** *He also designs and translates programs for Adventure International.)*

```
        TSTA                    A zero marks the end of
                                the data
        BEQ     MORE            If all data has been
                                written, go on . . .
        JSR     PRINT           Write the character to the
                                file
        BRA     LOOP            Loop back for next
                                character to write
DATA    FCC     /PLASTIC        SPOONS: 360 DOZEN/
        FCB     $0              A zero marks the end
```

The fourth routine is Input, and it is used to read in data from a cassette file opened in the input mode. If you chose a display status of $FF when you opened the file, then an F will blink on the screen as data is read in. Again, this routine will only deal with one character at a time. No register preparation is needed for this routine, so simply call it directly to read a character from the file. On return, the A register will hold the ASCII code of the character that was read in from the file.

This example will read in a block of 512 characters and show them on the screen:

```
        LDX     #$400           Point X at beginning of
                                the text screen
LOOP    JSR     INPUT           Read a character from the
                                file
        STA     ,X+             Put it on the screen and
                                increment X
        CMPX    #$600           Check if we have covered
                                the entire screen
        BNE     LOOP            If not, then loop back for
                                more
```

The fifth routine is Skipf, and it may be used to serve two different purposes. First off, you may use Skipf to skip over a file on the cassette. However, you may also use it to verify files. You see, as the computer skips over the cassette file, it also reads the information carefully and watches for checksum errors. This means that if the computer is able to Skipf through a file without causing any errors, then you can be reasonably sure that the recording on the cassette is good, and that you won't get any load errors when you try to use that file at a future time.

The Skipf routine requires that you prepare the X and B registers in exactly the same manner as the Open routine. That is, you must load the X register with the address of where in memory the filename is stored and B register with the display status.

This example will search the cassette for a file named OUTGOING and will then verify and skip over it. The screen will not be affected in any way:

```
        LDX     #NAME           Load X with the address
                                of the name
        LDB     #$0             Use a display status value
                                of zero
        JSR     SKIPF           Skip over and verify the
                                file
        BRA     MORE            Program continues . . .
NAME    FCC     /OUTGOING/
        FCB     $0              Zero marks the end of the
                                name
```

The sixth routine is Cloadm. It will load any machine language program from cassette that may ordinarily be loaded with the BASIC statement *CLOADM*. To use this routine you must provide the address of the filename and the display status, as with Open and Skipf. In addition, you must put the offset that the computer should use in loading your program in the Y register. If you want the computer to load the program normally, not offset, then specify an offset of zero.

This example will load the program MODULE1 from cassette with no offset. The screen will remain unaffected:

```
        LDX     #NAME           Load X with the address
                                of the name
        LDB     #$0             Use a display status value
                                of zero
        LDY     #$0             Load the program nor-
                                mally, not offset
        JSR     CLOADM          Load the program
        BRA     MORE            Program continues . . .
NAME    FCC     /MODULE1/
        FCB     $0              Zero marks the end of the
                                name
```

The seventh routine is Csavem. It allows you to save a machine language program or block of memory onto tape in a format that may be loaded back in with Cloadm. Please note that you must have Extended Color BASIC to use this routine.

This routine requires that you prepare the X, Y, U, and D registers with necessary information. As with many other routines, you must first load the X register with the location of the filename. Next, load the starting address of your program into Y and the ending address into U. Finally, load the execution address into the D register. When you call on the routine, everything in memory from address Y to address U will be written on tape.

This example will write everything in memory from $E00 through $FFF onto tape with a filename of *RAMTEST*. The execution address will be $E00:

```
        LDX     #NAME           Load X with the address
                                of the name
        LDY     #$E00           The starting address
        LDU     #$FFF           The ending address
        LDD     #$E00           The execution address
        JSR     CSAVEM          Write it all on tape
        BRA     MORE            Program continues . . .
NAME    FCC     /RAMTEST/
        FCB     $0              Zero marks the end of the
                                name
```

The eighth routine is Motor. It allows you to turn the tape recorder's motor on and off. Simply load $FF into the B register to turn it on, or zero to turn it off. This example will turn the cassette motor off:

```
        LDB     #$0             Zero means off
        JSR     MOTOR           Turn off recorder's motor
```

The ninth and final routine is Audio. It allows you to connect the output from the tape recorder directly to the television's speaker. Load $FF into the B register to turn on this feature, or zero to turn it off. This example will play the recorder's sound over the television's speaker:

```
        LDB     #$FF            $FF means on
        JSR     AUDIO           Turn the cassette audio
                                on
```

And those are the nine routines provided in the program listing. Now let's look at the general requirements and conditions that apply to all nine routines.

All routines require that you leave low memory from $0 to

$3FF alone. This area is used by the ROMs in performing the various cassette functions. All routines will work on any Color Computer, right on down to 4K Color BASIC. The only exception is the Csavem routine which requires Extended Color BASIC.

Each of the routines will preserve the X, Y, U, A and DP registers. The contents of the CC and B registers will be lost. After you call a routine, check the zero flag. If it is set, then the operation was carried out successfully. If, however, it is reset, then an error has occurred and the error code is in the B register. The table lists the error codes and what they mean.

This example shows how to use the error system to determine if an error has occurred:

```
JSR     XYZ     Call one of the nine routines
BNE     ERROR   If zero flag is reset, then an error
(More
code)           Operation was carried out successfully
```

Please note that this program makes extensive use of undocumented ROM routines. This means that the program shown in the listing very well may not work with future versions of Color BASIC. (The program was written for Color BASIC 1.1, but should also work with 1.0.).

Now you should find it a whole lot easier to incorporate cassette I/O into your machine language programs. If you have any questions or comments, feel free to drop me a line. My address appears at the top of the program listing. Please include a self addressed, stamped envelope when you write. The source code for the program listing is available on cassette for five dollars at the same address: 2054 Manning Avenue, Los Angeles, CA 90025.

Table Of Error Codes

Code	Abbr	Description
19	AO	File already open
21	IO	Input/Output error
22	FM	Bad file mode
23	NO	File not open
24	IE	Input past end of file

```
                61000 ***********************************
                61010 * MACHINE LANGUAGE CASSETTE I/O *
                61020 ***********************************
                61030 *
                61040 *By: Roger Schrag
                61050 *    2054 Manning Avenue
                61060 *    Los Angeles, CA 90025
                61070 *
                61080 *Final revision: 5/15/83
                61090 *
                61100 *This code is intended to be appended
                61110 *on to your own program to give it
                61120 *cassette I/O capabilities. Your progra
                61130 *must supply the ORG statement. This code
                61140 *may reside anywhere in RAM.
                61150 *
                61160 *
0000    00      61170 SAVE    FCB     $0      3 byte storage
0001    00      61180         FCB     $0      Area for the
```


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```
0002   00      61190          FCB    $0      $18E error vector
0003   00      61200 STACK    FCB    $0      2 byte storage area
0004   00      61210          FCB    $0      For stack pointer
               61220 *
               61230 *
               61240 *Routine to open a data file
               61250 *   X=Address of filename
               61260 *   A=File mode
               61270 *   B=Display status
               61280 *
0005 17 00C4   61290 OPEN     LBSR   BEGIN   Prepare
0008 17 009B   61300          LBSR   FNAME   Process the filename
000B 81 49     61310          CMPA   #$49    Use input mode?
000D 27 07     61320          BEQ    OPENI   If so, then go do it
000F 81 4F     61330          CMPA   #$4F    Use output mode?
0011 27 09     61340          BEQ    OPENO   If so, then go do it
0013 7E A616   61350          JMP    $A616   Cause FM error
0016 BD A629   61360 OPENI    JSR    $A629   Open file for input
0019 16 00DF   61370          LBRA   DONE    Function complete
001C 4F        61380 OPENO    CLRA           Must clear A first
001D BD A65B   61390          JSR    $A65B   Open file for output
0020 16 00D8   61400          LBRA   DONE    Function complete
               61410 *
               61420 *
               61430 *Routine to close a data file
               61440 *   (No register setup required)
               61450 *
0023 17 00A6   61460 CLOSE    LBSR   BEGIN   Prepare
0026 BD A437   61470          JSR    $A437   Close the data file
0029 16 00CF   61480          LBRA   DONE    Function complete
               61490 *
               61500 *
               61510 *Routine to write to an open file
               61520 *   A=Character to write
               61530 *
002C 17 009D   61540 PRINT    LBSR   BEGIN   Prepare
002F BD A290   61550          JSR    $A290   Write to the file
0032 16 00C6   61560          LBRA   DONE    Function complete
               61570 *
               61580 *
               61590 *Routine to input from an open file
               61600 *   (A returns with input character)
               61610 *
0035 17 0094   61620 INPUT    LBSR   BEGIN   Prepare
0038 0F 70     61630          CLR    $70     Must clear $70 first
003A BD A17F   61640          JSR    $A17F   Input from the file
003D A7 60     61650          STA    0,S     Put it on the stack
003F 16 00B9   61660          LBRA   DONE    Function complete
               61670 *
               61680 *
               61690 *Routine to skip over a file
               61700 *   X=Address of filename
               61710 *   B=Display status
               61720 *
0042 17 0087   61730 SKIPF    LBSR   BEGIN   Prepare
0045 17 005E   61740          LBSR   FNAME   Process the filename
0048 BD A5EE   61750          JSR    $A5EE   Skip over the file
004B 16 00AD   61760          LBRA   DONE    Function complete
               61770 *
               61780 *
               61790 *Routine to load a machine language program
               61800 *   X=Address of filename
               61810 *   Y=Offset
               61820 *   B=Display status
               61830 *
004E 17 007B   61840 CLOADM    LBSR   BEGIN   Prepare
0051 34 20     61850          PSHS   Y       Save the offset
0053 17 0050   61860          LBSR   FNAME   Process the filename
0056 BD A648   61870          JSR    $A648   Do some of the work
0059 35 10     61880          PULS   X       Put offset in X
005B BD A511   61890          JSR    $A511   Load the program
005E 16 009A   61900          LBRA   DONE    Function complete
               61910 *
               61920 *
               61930 *Routine to save a machine language program
               61940 * (Extended Color Basic is required)
               61950 *   X=Address of filename
               61960 *   Y=First address
               61970 *   U=Last address
               61980 *   D=Execution address
               61990 *
0061 17 0068   62000 CSAVEM    LBSR   BEGIN   Prepare
0064 34 66     62010          PSHS   Y,D,U   Save information
0066 17 003D   62020          LBSR   FNAME   Process the filename
0069 35 66     62030          PULS   U,D,Y   Restore information
```


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```
006B 30  8D 008C  62040        LEAX   DONE,PCR  When save is complete
006F 34  10       62050        PSHS   X         Control will go to DONE
0071 34  20       62060        PSHS   Y         Push start address
0073 10BF 01E7    62070        STY    $1E7      Save start address
0077 34  40       62080        PSHS   U         Push end address
0079 34  06       62090        PSHS   D         Push execute address
007B FD  01E5     62100        STD    $1E5      Save execute address
007E 7E  833D     62110        JMP    $833D     Go save program
                  62120 *
                  62130 *
                  62140 *Routine to control tape recorder's motor
                  62150 *   B=FF (Turn it on)
                  62160 *   B=0  (Turn it off)
                  62170 *
0081 17  0048     62180 MOTOR    LBSR   BEGIN    Prepare
0084 5D           62190          TSTB           Turn on motor?
0085 26  06       62200          BNE    MOTORN  If so, go turn it on
0087 BD  A7EB     62210          JSR    $A7EB   Go turn off motor
008A 16  006E     62220          LBRA   DONE    Function complete
008D BD  A7CA     62230 MOTORN   JSR    $A7CA   Go turn on motor
0090 16  0068     62240          LBRA   DONE    Function complete
                  62250 *
                  62260 *
                  62270 *Routine to control the cassette audio
                  62280 *   B=FF (Turn it on)
                  62290 *   B=0  (Turn it off)
                  62300 *
0093 17  0036     62310 AUDIO    LBSR   BEGIN    Prepare
0096 5D           62320          TSTB           Turn on the audio?
0097 26  06       62330          BNE    AUDION  If so, go turn it on
0099 BD  A974     62340          JSR    $A974   Go turn off audio
009C 16  005C     62350          LBRA   DONE    Function complete
009F 5F           62360 AUDION   CLRB           Must clear B first
00A0 BD  A99D     62370          JSR    $A99D   Go turn on audio
00A3 16  0055     62380          LBRA   DONE    Function complete
```


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```
                  62390 *
                  62400 *
                  62410 *The routines below are for internal use
                  62420 *only, and are not to be called by your
                  62430 *program directly!
                  62440 *
                  62450 *
                  62460 *Routine to process a filename
                  62470 *
00A6 D7   68      62480 FNAME    STB    $68       Set display status
00A8 CE   01D1    62490          LDU    #$1D1     Name storage area
00AB 6F   C0      62500          CLR    ,U+       Name length=0
00AD C6   20      62510          LDB    #$20      ASCII code for blank
00AF E7   C0      62520 CLEAR    STB    ,U+       Clear name area
00B1 1183 01DA    62530          CMPU   #$1DA     End of name area?
00B5 25   F8      62540          BLO    CLEAR     Loop back until done
00B7 CE   01D2    62550          LDU    #$1D2     Start of name area
00BA E6   80      62560 NAME     LDB    ,X+       Get part of filename
00BC C1   20      62570          CMPB   #$20      A null or C/R marks
00BE 25   0B      62580          BLO    RETURN    End of the name
00C0 E7   C0      62590          STB    ,U+       Store the character
00C2 7C   01D1    62600          INC    $1D1      Increment name length
00C5 1183 01DA    62610          CMPU   #$1DA     Loop back if we haven't
00C9 25   EF      62620          BLO    NAME      Exceeded maximum length
00CB 39           62630 RETURN   RTS              Return to caller
                  62640 *
                  62650 *
                  62660 *Routine to prepare everything:
                  62670 *(Save registers, set up error vector, etc.)
                  62680 *
00CC 34   7A      62690 BEGIN    PSHS   X,Y,U,DP,A  Save registers
00CE 4F           62700          CLRA             ROM routines need
00CF 1F   8B      62710          TFR    A,DP      The DP to be zero
00D1 B6   018E    62720          LDA    $18E      Get the contents
00D4 FE   018F    62730          LDU    $18F      Of the error vector
00D7 A7   8D FF25 62740          STA    SAVE,PCR  And save it
00DB EF   8D FF22 62750          STU    SAVE+1,PCR For now
00DF 86   7E      62760          LDA    #$7E      Now set up
00E1 33   8D 0012 62770          LEAU   ERROR,PCR Error vector
00E5 B7   018E    62780          STA    $18E      With our own
00E8 FF   018F    62790          STU    $18F      Handling routine
00EB A6   60      62800          LDA    0,S       Restore A register
00ED EE   66      62810          LDU    6,S       Restore U register
00EF 10EF 8D FF0F 62820          STS    STACK,PCR Save stack pointer
00F4 6E   F8 08   62830          JMP    [8,S]     Return to caller
                  62840 *
                  62850 *
                  62860 *If an error occurs, control will pass
                  62870 *to our error handling routine
                  62880 *
00F7 54           62890 ERROR    LSRB             B=Error code
00F8 5C           62900          INCB             Divide by 2, add 1
00F9 20   03      62910          BRA    EXIT      Go to exit routine
                  62920 *
                  62930 *
                  62940 *If the function is completed properly,
                  62950 *control will pass to DONE
                  62960 *
00FB 5F           62970 DONE     CLRB             Zero means no error
00FC 20   00      62980          BRA    EXIT      Go to exit routine
                  62990 *
                  63000 *
                  63010 *Routine to restore registers and error
                  63020 *vector, and return to the calling program
                  63030 *
00FE A6   8D FEFE 63040 EXIT     LDA    SAVE,PCR  Restore the
0102 EE   8D FEFB 63050          LDU    SAVE+1,PCR Error vector
0106 B7   018E    63060          STA    $18E      To its original
0109 FF   018F    63070          STU    $18F      Value
010C 10EE 8D FEF2 63080          LDS    STACK,PCR Restore stack pointer
0111 35   7A      63090          PULS   A,DP,U,Y,X Restore registers
0113 32   62      63100          LEAS   2,S       Clean up the stack
0115 5D           63110          TSTB             Set flags if no error
0116 39           63120          RTS              Return to caller
                  63130 *
                  63140 *Your program supplies the label START
            0000  63150          END
00000 TOTAL ERRORS
```

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GHOST GOBBLER

From Spectral Associates, this "Pac" theme game is the best of it's type. Brilliant color, action and sound, just like an arcade gobble your way to glory, but watch for those ghosts! Get in on the wild fun of this game craze now. Tape: $21.95, Disk: $25.95

GHOST GOBBLER

DONKEY KING

DONKEY KING

You simply can not buy a more impressive game for your color computer than this new wonder from Tom Mix. The graphics, sound, and animation are all just astonishing! There are four different graphic screens and each is endless fun. Requires 32K. Tape: $24.95, Disk: $27.95





PROTECTORS

There are several good versions of the "Defender" theme available for the CoCo. None, however, rival this one from Tom Mix. No other game matches the detailed graphics and sheer excitement of this top seller. Requires 32K. Tape: $24.95, Disk: $27.95



CREATURE FEATURE

From Color Software, comes a lightening swift shoot & dodge the enemy game. It's clever cross between "Robotron" and "Beserk" themes, with bullets flying everywhere. Solid, shoot-em-up-fun. Requires 16K. Tape: $17.95. Disk: $19.95



ANDROID ATTACK

Spectral Associates' very well done "Berserk" type game with some interesting added features. Each cassette contains both the 16K and 32K version. The 32K version has voice output! Plenty of action. Tape: $21.95



FROGGER

Just released by The Cornsoft Group, this is the officially licensed version from Sega, the arcade manufacturer. It has it all! 4 lane super highway, snakes, turtles, logs, alligators, etc. Lots of action and laughs! Requires 16K. Tape: $19.95



INTERGALACTIC FORCE

Your space fighter roars into the Death Corridor. Lock-on and blast the enemy fighter from the sky. Now try dropping one into Death Star's narrow exhaust vent. It takes skill and guts. Good luck! With "Star Wars" theme song. From Anteco. Tape: $24.95

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This one has received outstanding reviews. Its unique design fits the hand beautifully and it has the truly fast and positive response needed for high speed play. Actually out-performs some joysticks that cost $50 or more.

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32K ECB

the RAINBOW



How many times have you seen a flag and were stumped as to which country it belonged to? Well, here is a program, submitted by Joseph S. Paravati of Yorktown Heights, New York, called *Flags*. It not only provides beautiful, high-res graphic illustrations of 23 nations' flags, but is an educational tool as well. Joseph reminds us to make sure the screen is blue at the beginning of the program. If not, simply push the reset button and *RUN* the program again.

The menu displays the names of 23 countries in which you can either enter the corresponding number of the desired country, or type 0 for an automatic flag display of each country.

The most impressive aspect of *Flags* is watching the computer fill in the colors of the flags and slowly type the name of each country underneath the illustration, demonstrating the full color capabilities of your CoCo.

Flags is impressively beautiful, and more importantly, you will be able to identify more flags as a result of using this educational program.

90	01B5	1360	140D
250	03E1	1530	1721
500	0700	1680	196B
740	09CD	1790	1CB1
960	0D57	1950	1F50
1080	0E75	5230	220C
1200	1147	END	24D9

The listing:

```
1Ø ' ***FLAGS*** BY J.S.PARAVATI
     12/82
2Ø CLS:PRINT @7,"***COLOR TEST**
*":PRINT STRING$(32,"*")
3Ø PRINT:PRINT "PRESS ANY KEY. I
F SCREEN IS NOT BLUE PRESS RESET
 BUTTON ON BACK OF COMPUTER AND
RE-RUN PROGRAM. DO THIS UNTIL SC
REEN IS BLUE.":PRINT "WHEN SCREE
N IS OK(BLUE) THEN    PRESS ANY
KEY TO CONTINUE."
4Ø K$=INKEY$:IF K$="" THEN 4Ø
5Ø PMODE4,1:PCLS:SCREEN1,1:PMODE
3,1:PCLS6
6Ø K$=INKEY$:IF K$="" THEN 6Ø
7Ø GOSUB 5Ø4Ø
8Ø CLS:PRINT @4,"***FLAGS OF THE
 WORLD***":PRINT STRING$(32,"*")
;
9Ø JP=Ø:K=Ø
1ØØ PRINT "<1>AFGHANISTAN","<13>
CZECH"
11Ø PRINT "<2>ALBANIA","<14>DENM
ARK"
12Ø PRINT "<3>ALGERIA","<15>FINL
AND"
13Ø PRINT "<4>ARGENTINA","<16>FR
ANCE"
14Ø PRINT "<5>AUSTRALIA","<17>GE
RMANY(W)
15Ø PRINT "<6>AUSTRIA","<18>GREE
CE"
16Ø PRINT "<7>BELGIUM","<19>ISRA
EL"
17Ø PRINT "<8>BOLIVIA","<2Ø>ITAL
```

(Joseph Paravati, now retired, was an electronic troubleshooter for the New York City Bus Company. He is a self-taught computer hobbyist who started programming in December 1981 in order to occupy his spare time and give his three children a head start with computers.)

```
Y"
180 PRINT "<9>BRAZIL","<21>JAPAN
"
190 PRINT "<10>CANADA","<22>ENGL
AND (UK)";
200 PRINT "<11>COLOMBIA","<23>U.
S.A"
210 PRINT "<12>COSTA RICA","<0>A
UTOMATIC"
220 IF JP=1 THEN K=K+1:FOR T=1 T
O 2000:NEXT T:GOTO 250
230 INPUT "ENTER NUMBER FOR FLAG
. TO RETURN TO MENU PRESS ANY KE
Y ";K
240 IF K=0 THEN JP=1:K=1
250 IF K>23 THEN GOTO 80
260 ON K GOTO 290,400,560,660,73
0,900,950,980,1010,1150,1250,129
0,1320,1370,1400,1450,1480,1510,
1550,1610,1640,1680,1860
270 ' GRAPHICS FOR FLAGS
280 ' AFGHANISTAN
290 PRINT:CLS2
300 FOR Y=4 TO 10
310 FOR X=2 TO 61
320 RESET(X,Y-1):SET(X,Y+7,4):SE
T(X,Y+14,1)
330 NEXT X,Y
340 PRINT @67,CHR$(134+16)+CHR$(
128)+CHR$(128)+CHR$(137+16);
350 PRINT @99,CHR$(137+16)+CHR$(
128)+CHR$(128)+CHR$(134+16);
360 PRINT @132,CHR$(140+16)+CHR$
(140+16);
370 PRINT @100,CHR$(132+16)+CHR$
(136+16);
380 PRINT @491,"AFGHANISTAN";:GO
TO 1960
390 ' ALBANIA
400 PRINT:CLS2
410 FOR Y=4 TO 24
420 FOR X=2 TO 61
430 SET(X,Y,4)
440 NEXT X,Y
450 PRINT @175,CHR$(130+48)+CHR$
(143+48)+CHR$(129+48);
460 PRINT @207,CHR$(138+48)+CHR$
(128)+CHR$(133+48);
470 PRINT @238,CHR$(137+48)+CHR$
(143+48)+CHR$(143+48)+CHR$(143+4
8)+CHR$(134+48);
480 PRINT @269,CHR$(137+48);:PRI
NT @275,CHR$(134+48);
490 PRINT @240,CHR$(128);:PRINT
@272,CHR$(128);
500 PRINT @303,CHR$(137+48);:PRI
NT @305,CHR$(134+48);
510 PRINT @336,CHR$(131+48);
520 PRINT @206,CHR$(134+48);:PRI
NT @210,CHR$(137+48);:PRINT @173
,CHR$(134+48);:PRINT @179,CHR$(1
37+48);
530 SET(32,6,2)
540 PRINT @493,"ALBANIA";:GOTO 1
960
550 ' ALGERIA
560 PMODE 3,1:PCLS7:SCREEN 1,1:C
OLOR 6
570 LINE(10,25)-(245,150),PSET,B
580 LINE(128,25)-(128,150),PSET
590 PAINT(50,140),6,6:PAINT(140,
140),5,6
600 CIRCLE(135,82),24,8,1,.12,.8
8
610 CIRCLE(128,82),30,8,1,.1,.90
620 PAINT(104,81),4,4:COLOR 4
630 CIRCLE(140,81),7:PAINT(140,8
1),4,4
640 A$="ALGERIA":B$="S8C5BM85,17
0":GOSUB 5080:GOTO 1960
650 ' ARGENTINA
660 PMODE 3,1:PCLS6:SCREEN 1,1:C
OLOR 5
670 LINE(10,25)-(245,150),PSET,B
680 LINE(10,66)-(245,66),PSET
690 LINE(10,107)-(245,107),PSET
700 PAINT(128,38),7,5:PAINT(128,
145),7,5:PAINT(128,96),5,5
710 A$="ARGENTINA":B$="C5S8BM75,
170":GOSUB 5080:GOTO 1960
720 ' AUSTRALIA
730 PMODE4,1:PCLS:SCREEN 1,1:PMO
DE3,1:COLOR6
740 LINE(10,25)-(245,150),PSET,B
750 COLOR 8:LINE(10,25)-(125,94)
,PSET,B:PAINT(15,90),7,8
760 DRAW"S4C8BM64,26;D30NL54BD7N
L54D30R7U30NR54BU7NR54U30"
770 LINE(10,25)-(65,56),PSET
780 LINE(10,29)-(61,56),PSET
790 LINE(125,25)-(72,55),PSET
800 LINE(125,29)-(76,55),PSET
810 LINE(72,63)-(124,93),PSET
820 LINE(72,67)-(120,93),PSET
830 LINE(64,63)-(12,93),PSET
840 LINE(64,67)-(16,93),PSET
850 PAINT(68,90),7,7
860 PAINT(48,33),6,8:PAINT(20,42
),6,8:PAINT(80,36),6,8:PAINT(108
,51),6,8:PAINT(104,75),6,8:PAINT
(80,84),6,8:PAINT(48,84),6,8:PAI
NT(28,72),6,8:COLOR6:LINE(10,25)
-(125,94),PSET,B:PAINT(136,120),
6,6
870 COLOR 8:CIRCLE(68,120),8:PAI
NT(68,120),8,8:CIRCLE(195,141),5
:PAINT(195,141),8,8:CIRCLE(195,3
3),5:PAINT(195,33),8,8:CIRCLE(14
8,87),5:PAINT(148,87),8,8:CIRCLE
(232,87),5:PAINT(232,87),8,8:CIR
```

```
CLE(216,108),3
880 A$="AUSTRALIA":B$="C7S8BM75,
170":GOSUB 5080:GOTO 1960
890 ' AUSTRIA
900 PRINT:CLS 3:FOR Y=4 TO 11
910 FOR X=2 TO 61
920 SET(X,Y,4):SET(X,Y+8,5):SET(
X,Y+16,4):NEXT X,Y
930 PRINT @492,"AUSTRIA";:GOTO 1
960
940 ' BELGIUM
950 PRINT:CLS 6:FOR Y=4 TO 24:FO
R X=4 TO 21:RESET(X,Y):SET(X+19,
Y,2):SET(X+38,Y,4):RESET(X,Y+1):
NEXT X,Y
960 PRINT @493,"BELGIUM";:GOTO 1
960
970 ' BOLIVIA
980 PRINT:CLS 5:FOR Y=4 TO 11:FO
R X=2 TO 61:SET(X,Y,4):SET(X,Y+8
,2):SET(X,Y+16,1):NEXT X,Y
990 PRINT @492,"BOLIVIA";:GOTO 1
960
1000 ' BRAZIL
1010 PMODE 3,1:PCLS 2:SCREEN 1,0
1020 COLOR 1:LINE(10,25)-(245,15
0),PSET,B
1030 LINE(128,40)-(228,90),PSET
1040 LINE-(128,140),PSET
```


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```
1050 LINE-(28,90),PSET
1060 LINE-(128,40),PSET
1070 CIRCLE(128,90),30,3,.9
1080 COLOR 3
1090 LINE(107,76)-(156,90),PSET
1100 LINE(105,80)-(154,94),PSET
1110 PAINT(124,98),3,3:PAINT(124
,80),3,3:PAINT(128,144),1,1
1120 COLOR 2:CIRCLE(116,105),5,,
.9:CIRCLE(108,99),3:CIRCLE(140,8
1),4:PSET(104,97):PSET(106,99):P
SET(120,90):PSET(128,99):PSET(13
2,103):PSET(140,108):PSET(144,11
2):PSET(104,90):PSET(144,99)
1130 A$="BRAZIL":B$="S8C1BM90,17
5":GOSUB 5080:GOTO 1960
1140 'CANADA
1150 PMODE 3,1:PCLS6:SCREEN1,1
1160 LINE(10,25)-(245,150),PSET,
B
1170 LINE(72,25)-(184,150),PSET,
B
1180 PAINT(28,147),8,8:PAINT(220
,147),8,8:PAINT(128,147),5,8:COL
OR 5:LINE(72,25)-(184,150),PSET,
B:COLOR 8
1190 LINE(128,40)-(118,50),PSET:
LINE-(108,42),PSET:LINE-(120,75)
,PSET:LINE-(108,68),PSET:LINE-(1
04,72),PSET:LINE-(92,68),PSET:LI
NE-(100,78),PSET:LINE-(78,75),PS
ET:LINE-(116,114),PSET
1200 LINE-(104,120),PSET:LINE-(1
28,117),PSET:LINE-(128,138),PSET
:LINE-(130,138),PSET:LINE-(130,1
17),PSET:LINE-(152,120),PSET:LIN
E-(140,111),PSET:LINE-(180,75),P
SET:LINE-(156,78),PSET:LINE-(168
,69),PSET
1210 LINE-(152,72),PSET:LINE-(14
8,69),PSET:LINE-(140,75),PSET:LI
NE-(152,44),PSET:LINE-(140,51),P
SET:LINE-(128,40),PSET
1220 PAINT(128,108),8,8
1230 A$="CANADA":B$="S8C5BM90,17
5":GOSUB 5080:GOTO 1960
1240 'COLOMBIA
1250 PMODE 3,1:PCLS:SCREEN1,0
1260 COLOR2:LINE(10,25)-(245,150
),PSET,BF:COLOR 3:LINE(10,99)-(2
46,123),PSET,BF:COLOR4:LINE(10,1
24)-(246,150),PSET,BF
1270 A$="COLOMBIA":B$="S8C3BM80,
175":GOSUB 5080:GOTO 1960
1280 'COSTA RICA
1290 PRINT:CLS0:FOR Y=4 TO 7:FOR
 X=2 TO 61:SET(X,Y,3):SET(X,Y+4,
5):SET(X,Y+8,4):SET(X,Y+12,4):SE
T(X,Y+16,5):SET(X,Y+20,3):NEXT X
,Y
```

```
1300 PRINT @492,"COSTA RICA";:GO
TO 1960
1310 ' CZECHOSLOVAKIA
1320 PMODE 3,1:PCLS6:SCREEN1,1
1330 COLOR5:LINE(10,25)-(245,150
),PSET,BF:COLOR8:LINE(10,90)-(24
5,150),PSET,BF
1340 COLOR7:LINE(10,25)-(100,90)
,PSET:LINE-(10,150),PSET:LINE-(1
0,25),PSET:PAINT(44,90),3,3
1350 A$="CZECHOSLOVAKIA":B$="S8C
5BM35,175":GOSUB 5080:GOTO 1960
1360 'DENMARK
1370 PRINT:CLS4:FOR X=2 TO 61:SE
T(X,16,5):NEXT X:FOR Y=4 TO 26:S
ET(20,Y,5):NEXT Y:FOR Y=0 TO 31:
FOR X=0 TO 2:RESET(X,Y):RESET(X+
61,Y):NEXT X,Y:FOR Y=0 TO 3:FOR
X=0 TO 63:RESET(X,Y):RESET(X,Y+2
8):NEXT X,Y
1380 PRINT @493,"DENMARK";:GOTO
1960
1390 'FINLAND
1400 PMODE3,1:PCLS6:SCREEN1,1
1410 COLOR5:LINE(10,25)-(245,150
),PSET,BF:DRAW"S4C7BM10,81;R58BR
14R162D14L162BL14L58U14BR58U56R1
4D56BD14D56L14U56"
1420 PAINT(76,90),7,7
1430 A$="FINLAND":B$="S8C5BM84,1
75":GOSUB 5080:GOTO 1960
1440 'FRANCE
1450 PRINT:CLS2:FOR Y=4 TO 24:FO
R X=2 TO 20:SET(X,Y,3):SET(X+21,
Y,5):SET(X+41,Y,4):NEXT X,Y
1460 PRINT @493,"FRANCE";:GOTO 1
960
1470 'WEST GERMANY
1480 PRINT:CLS7:FOR Y=4 TO 11:FO
R X=2 TO 61:RESET(X,Y):SET(X,Y+8
,4):SET(X,Y+16,8):NEXT X,Y
1490 PRINT @490,"WEST GERMANY";:
GOTO 1960
1500 'GREECE
1510 PMODE3,1:PCLS6:SCREEN1,1
1520 COLOR7:LINE(20,25)-(235,146
),PSET,BF:DRAW"S4C5BM118,26;R20D
50R95D20L95D50L20U50L95U20R95U50
":PAINT(128,90),5,5
1530 A$="GREECE":B$="S8C5BM95,17
0":GOSUB 5080:GOTO 1960
1540 'ISRAEL
1550 PMODE3,1:PCLS5:SCREEN1,1
1560 COLOR7:LINE(10,25)-(245,150
),PSET,B:LINE(10,32)-(245,50),PS
ET,BF:LINE(10,144)-(245,126),PSE
```


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```
T,BF
157Ø LINE(128,6Ø)-(1ØØ,1Ø5),PSET
:LINE-(155,1Ø5),PSET:LINE-(128,6
Ø),PSET
158Ø LINE(128,118)-(1ØØ,75),PSET
:LINE-(156,75),PSET:LINE-(128,11
8),PSET:PAINT(128,19Ø),6,7
159Ø A$="ISRAEL":B$="S8C5BM9Ø,17
5":GOSUB 5Ø8Ø:GOTO 196Ø
16ØØ 'ITALY
161Ø PRINT:CLS3:FOR Y=4 TO 24:FO
R X=4 TO 21:SET(X,Y,1):SET(X+19,
Y,5):SET(X+38,Y,4):NEXT X,Y
162Ø PRINT @493,"ITALY";:GOTO 19
6Ø
163Ø 'JAPAN
164Ø PMODE4,1:PCLS:SCREEN1,1:PMO
DE3,1
165Ø COLOR8:LINE(1Ø,25)-(245,15Ø
),PSET,BF:COLOR7:CIRCLE(128,9Ø),
4Ø,,.9:PAINT(128,9Ø),7,7
166Ø A$="JAPAN":B$="S8C7BM98,175
":GOSUB 5Ø8Ø:GOTO 196Ø
167Ø 'ENGLAND-UNITED KINGDOM
168Ø PMODE4,1:PCLS:SCREEN1,1:PMO
DE3,1
169Ø COLOR6:LINE(1Ø,25)-(246,145
),PSET,BF:DRAW"S4C7BM122,25;D55L
112D1ØR112D55R12U55R112U1ØL112U5
5L12":PAINT(128,9Ø),7,7
17ØØ COLOR8:DRAW"S4C8BM121,25;ND
52L1D52BD1L11ØD1R11ØBR1BD13D53L1
U53L11ØU1R11ØBR14D53R1U53R11ØD1L
11ØBU13R11ØU1L111U53R1D53"
171Ø COLOR8:LINE(1Ø,25)-(246,145
),PSET,B
172Ø COLOR8:LINE(16,25)-(122,78)
,PSET:LINE-(1ØØ,78),PSET:LINE-(1
Ø,33),PSET:PAINT(1Ø8,72),8,8:PSE
T(123,78,4)
173Ø COLOR7:LINE(1Ø,26)-(115,78)
,PSET:LINE-(1Ø6,78),PSET:LINE-(1
Ø,3Ø),PSET:LINE-(1Ø,26),PSET:PAI
NT(8Ø,63),7,7
174Ø COLOR8:LINE(136,96)-(244,15
Ø),PSET:LINE(152,93)-(255,144),P
SET:PAINT(188,117),8,8
175Ø COLOR7:LINE(146,93)-(248,14
4),PSET:LINE-(24Ø,144),PSET:LINE
-(138,93),PSET:LINE-(146,93),PSE
T:PAINT(196,12Ø),7,7
176Ø COLOR8:LINE(136,75)-(236,25
),PSET:LINE(152,78)-(246,31),PSE
T:PAINT(188,54),8,8
177Ø COLOR7:LINE(238,26)-(246,26
),PSET:LINE-(145,77),PSET:LINE-(
138,77),PSET:LINE-(24Ø,26),PSET:
PAINT(188,54),7,7
178Ø COLOR8:LINE(118,96)-(14,148
),PSET:LINE(99,93)-(3,141),PSET:
PAINT(64,117),8,8
179Ø COLOR7:LINE(116,94)-(17,144
),PSET:LINE-(1Ø,144),PSET:LINE-(
11Ø,94),PSET:LINE-(116,94),PSET:
PAINT(48,126),7,7
18ØØ COLOR6:LINE(9 ,25)-(247,145
),PSET,B
181Ø LINE(1Ø,25)-(246,145),PSET,
B
182Ø PAINT(1Ø,146),5,6:PAINT(4,1
4Ø),5,6:PAINT(248,14Ø),5,6
183Ø COLOR5:LINE(8,25)-(246,145)
,PSET,B
184Ø A$="UNITED KINGDOM":B$="S8C
8BM4Ø,165":GOSUB 5Ø8Ø:A$="-ENGLA
ND-":B$="S8C8BM73,185":GOSUB 5Ø8
Ø:GOTO 196Ø
185Ø ' UNITED STATES
186Ø PMODE4,1:PCLSØ:SCREEN1,1:PM
ODE3,1
187Ø COLOR8:LINE(1Ø,25)-(245,15Ø
),PSET,BF:COLOR7:FOR Y=34.6 TO 1
41 STEP9.6:LINE(11,Y)-(244,Y),PS
ET:NEXT Y
188Ø COLOR7:LINE(1Ø,25)-(245,15Ø
),PSET,B:FOR Y=3Ø.6 TO 146 STEP
19.2:PAINT(128,Y),7,7:NEXT Y
189Ø COLOR6:LINE(1Ø,25)-(1Ø8,92)
,PSET,BF
```


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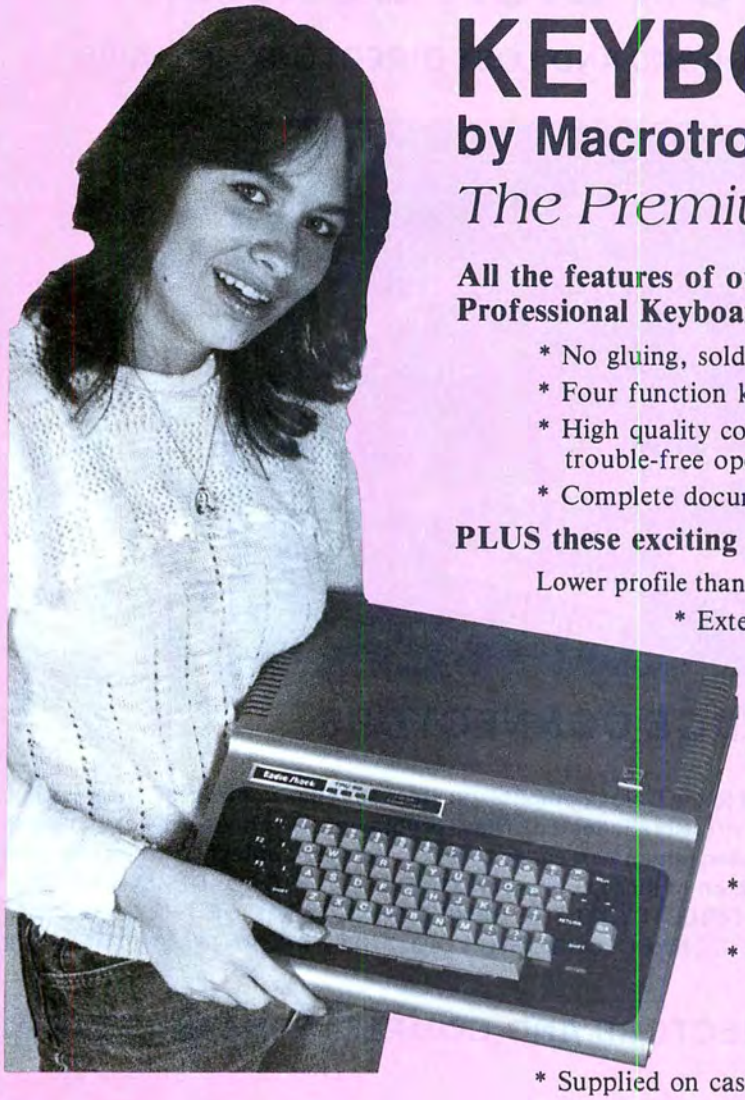
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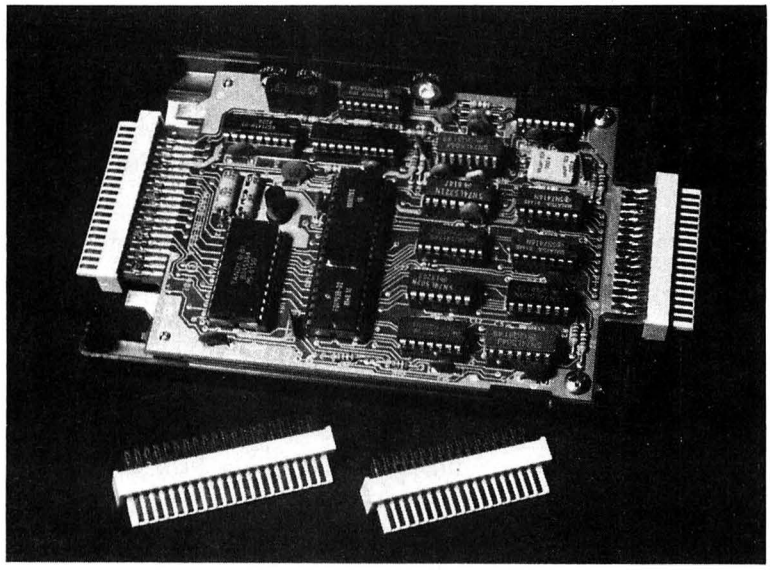
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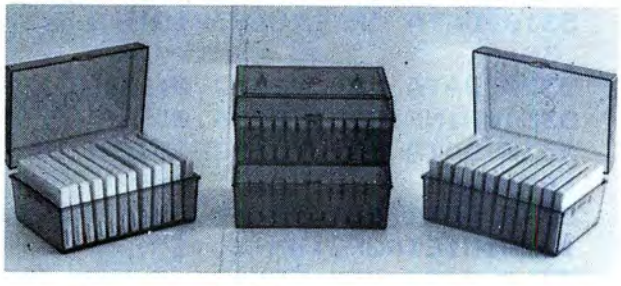
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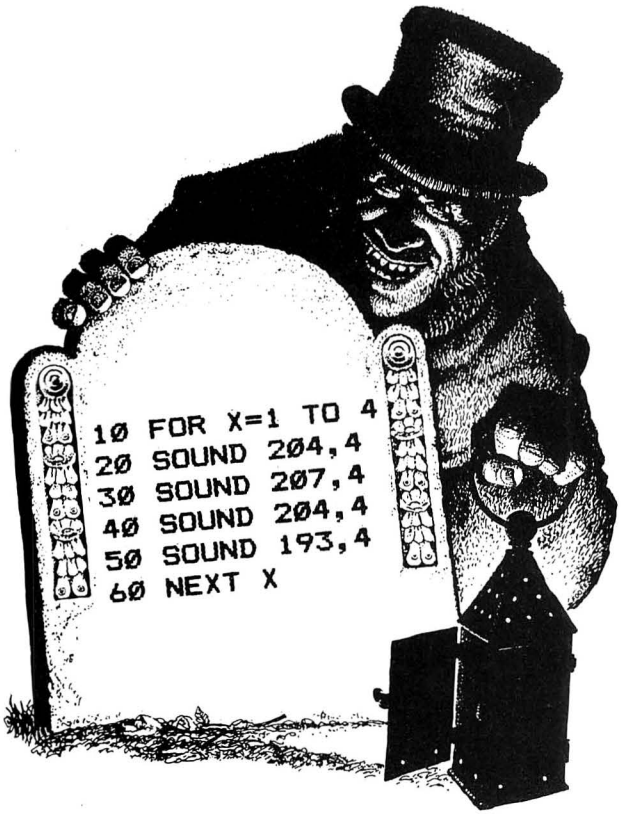
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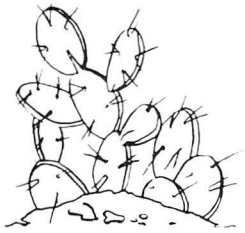
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```
1900 COLOR5:LINE(10,25)-(245,150
),PSET,B
1910 FOR Y=31 TO 94 STEP 14:FOR
X=18 TO 98 STEP 16:PSET(X,Y,8):I
F X<96 THEN PSET(X+8,Y+8,8)
1920 NEXT X,Y
1930 A$="UNITED STATES OF":B$="C
6S8BM18,168":GOSUB 5080:A$="AMER
ICA":B$="C7S8BM87,188":GOSUB 508
0:GOTO 1960
1940 '
1950 '
1960 IF JP=1 THEN 220 ELSE K$=IN
KEY$:IF K$="" THEN 1960 ELSE GOT
O 80
5000 ' ***CHRACTER GEN.<2>***
        *SUBROUTINE*
5010 '
5020 'SUBROUTINE MAIN PROGRAM BY
 J.S.PARAVATI          DATA FROM
TRS-80 MICROCOMPUTER NEWS 4/82
5030 '
5040 DIM X$(28),Y$(28)
5050 FOR N=1 TO 28
5060 READ X$(N),Y$(N)
5070 NEXT N:RETURN
5080 DRAW B$
5090 FOR J=1 TO LEN(A$)
5100 FOR L=1 TO 28
```



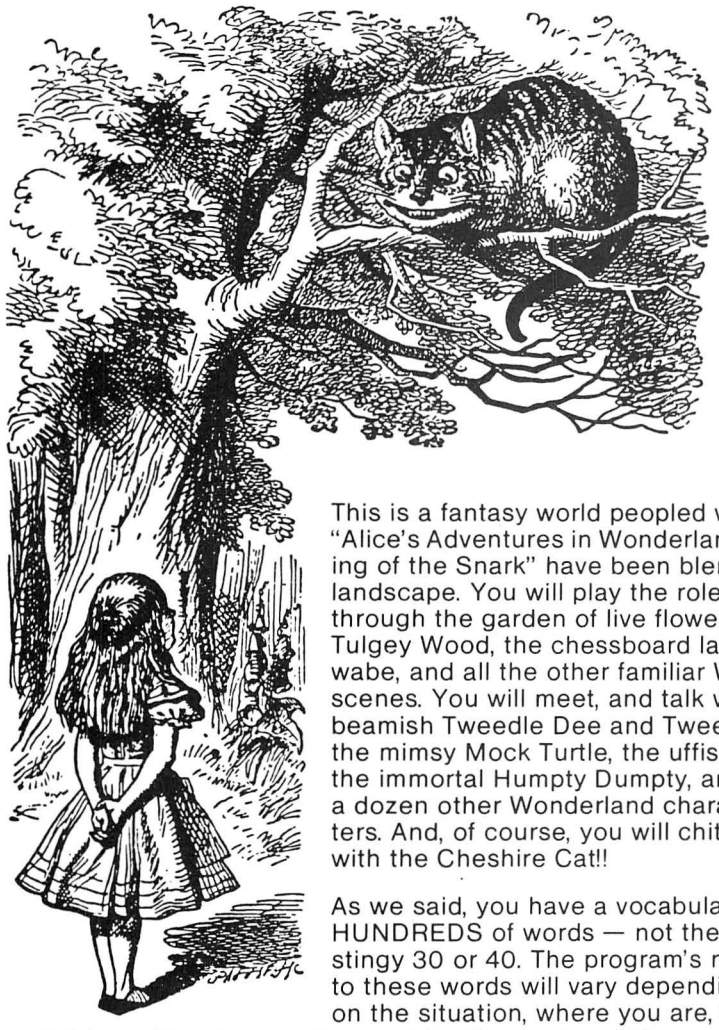

```
5110 IF MID$(A$,J,1)=X$(L) THEN
DRAW Y$(L)
5120 NEXT L
5130 NEXT J
5140 RETURN
5150 DATA " ","BM+7,0"
5160 DATA "A","U4E2F2D2NL4D2;BM+
3,0"
5170 DATA "B","U6R3F1D1G1NL3F1D1
G1L3;BM+7,0"
5180 DATA "C","BM+1,-0;H1U4E1R2F
1;BM+0,+4;G1L2;BM+6,0"
5190 DATA "D","U6R3F1D4G1L3;BM+7
,0"
5200 DATA "E","NR4U3NR2U3R4;BM+3
,+6"
5210 DATA "F","U3NR2U3R4;BM+3,+6
"
5220 DATA "G","BM+1,-0;H1U4E1R2F
1;BM+0,+2;NL1D2G1L2;BM+6,0"
5230 DATA "H","U3NU3R4NU3D3;BM+3
,0"
5240 DATA "I","BM+1,0;R1NR1U6NL1
R1;BM+4,+6"
5250 DATA "J","BM+0,-1;F1R1E1U5N
L1R1;BM+3,6"
5260 DATA "K","U3NU3R1NE3F3;BM+3
,0"
5270 DATA "L","NU6R4U1;BM+3,+1"
5280 DATA "M","U6F2ND1E2D6;BM+3,
0"
5290 DATA "N","U6F1D1F2D1F1NU6;B
M+3,0"
5300 DATA "O","BM+1,0;H1U4E1R2F1
D4G1L2;BM+6,0"
5310 DATA "P","U6R3F1D1G1L3;BM+7
,3"
5320 DATA "Q","BM+1,0;H1U4E1R2F1
D3G1NH1NF1G1L1;BM+6,0"
5330 DATA "R","U6R3F1D1G1L2NL1F3
;BM+3,0"
5340 DATA "S","BM+0,-1;F1R2E1U1H
1L2H1U1E1R2F1;BM+3,+5"
5350 DATA "T","BM+2,+0;U6NL2R2;B
M+3,+6"
5360 DATA "U","BM+0,-1;NU5F1R2E1
U5;BM+3,6"
5370 DATA "V","BM+0,-6;D2F1D1F1N
D1E1U1E1U2;BM+3,+6"
5380 DATA "W","NU6E2NU1F2U6;BM+3
,6"
5390 DATA "X","U1E4U1;BM-4,0;D1F
4D1;BM+3,0"
5400 DATA "Y","BM+0,-6;D2F2ND2E2
U2;BM+3,6"
5410 DATA "Z","NR4U1E4U1L4;BM+7,
6"
5420 DATA "-","BM+0,-3;R4;BM+3,+
3"
```



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Graphics Special — The '178' *POKE*

By Jim Hall

In the past few months there have been quite a few articles showing you how it is possible to display several colors on the high-resolution screens using complicated programs. Well, I have found how to display not only the four basic colors, but also 252 different patterns on the hi-res screens. Even better, no special program is necessary. Simply manipulate memory location 178. Almost any Extended BASIC graphics command located after *POKEing* a number into 178 in a program will then use the pattern specified by the number poked to produce a spectacular effect! Here's a short program to show you what I'm talking about:

```
10 PMODE3,1:SCREEN1,1:PCLS
20 X=RND(126):Y=RND(96):X2=255-X
:Y2=191-Y:W=RND(X):H=RND(Y)
30 N=RND(255):POKE178,N
40 LINE(X,Y)-(X-W,Y+H),PSET,BF
50 LINE(X2,Y)-(X2+W,Y+H),PSET,BF
60 LINE(X,Y2)-(X-W,Y2-H),PSET,BF
70 LINE(X2,Y2)-(X2+W,Y2-H),PSET,
BF
80 GOTO20
```

Line 30 does the trick. It *POKEs* a random number into location 178. All graphics commands after this line will use the pattern corresponding number located in 178 just as if it were one of the standard colors.

As I said, this method can be used for almost any graphics command (PCLS is the only one I could find that would not work). The following example shows how the *PAINT* command will use location 178.

```
10 PMODE4,1:SCREEN1,1:PCLS
20 COLOR1,0
30 CIRCLE(126,96),50
40 POKE 178,56
50 PAINT (126,96),,1
60 GOTO 60
```

I did not specify the paint color in line 50. This forces Extended BASIC to use the number in location 178 (56 in this case) to specify what pattern to use. Incidentally, if the following line were typed in:

45 COLOR1,0

the number stored in location 178 would be changed to a 1 by Extended BASIC and the circle would be filled in with white.

You're probably anxious to start using this new capability in your own programs by now, but are wondering if there is any logical connection between the number you choose to put in 178 and the pattern that results. The way Extended BASIC interprets the value is hard to explain—the "bit pattern" of the number that is stored in 178 is not directly used to fill in shapes and so there doesn't appear to be any logical connection. However, I created a program to display the 255 different patterns and colors to help you choose which ones are best for your program.

"... I have found how to display not only the four basic colors, but also 252 different patterns on the hi-res screens. Even better, no special program is necessary. Simply manipulate memory location 178."

Pressing the arrow keys will move the blinking box onto different patterns. Pressing "?" (or "/") will print the number to be *POKEd* into 178 to produce the pattern inside the blinking box. Press any key to return to the display. Pressing "b" will fill a large square with the selected pattern. Pressing the spacebar will fill a circle, box, and draw some lines using

(Jim Hall is a senior at the Columbus Academy and has been working with the Color Computer for 3 years.)

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the pattern. (Notice that when any key is pressed, the display will "scroll" using the subroutine starting at line 600. This may also be useful in your own programs.) Pressing "M" will switch the display between PMODE4 and PMODE 3, and pressing "S" will switch the screen number.

I'm sure you see the potential now of this technique. I can only guess why Radio Shack did not include this capability in Extended BASIC. Perhaps they thought it would confuse the beginning programmer.

The listing:

```
150 ..... 0280
208 ..... 03ED
END .... 04EC
```

```
3 PCLEAR8
4 'CLS
7 M=3:S=0
10 PMODEM,1:SCREEN1,S:PCLS
50 FOR X=12TO255 STEP17
60 FOR Y=2TO190 STEP 10
70 POKE 178,N:N=N+1:IFN=256 THEN
X=999:Y=999:GOTO90
80 LINE(X,Y)-(X+10,Y+6),PSET,BF
90 NEXTY,X
95 SOUND100,1
100 H=0:V=0
110 X=12+H*17:Y=1+V*10
120 LINE(X,Y)-(X+12,Y+8),PSET,B
130 A$=INKEY$
140 LINE(X,Y)-(X+12,Y+8),PRESET,
B
150 IFA$=""THEN120
155 N=H*19+V
160 IFA$=CHR$(8)THENH=H-1:IFH<0T
HENH=0
170 IFA$=CHR$(9)THENH=H+1:IFH>13
THENH=13
180 IFA$=CHR$(94)THENV=V-1:IFV<0
THENV=0
190 IFA$=CHR$(10)THENV=V+1:IFV>1
8THENV=18
191 IFN>255THENSOUND200,1:GOTO11
0
195 IF A$="/"ORA$="?"THEN300
200 IFA$=CHR$(32) THEN 400
205 IFA$="B"THEN PMODEM,5:SCREEN
1,S:PCLS:POKE178,N:LINE(76,46)-(
176,146),PSET,BF:FORQ=1TO200:NEX
T:GOTO600
207 IFA$="M"THENM=M+1:IFM=5THENM
=3:PMODEM,1:SCREEN1,S:ELSEPMODEM
,1:SCREEN1,S
208 IFA$="S"THENS=S+1:IFS=2THENS
=0:SCREEN1,S ELSESCREEN1,S
210 GOTO110
300 PRINTN
310 IFINKEY$=""THEN310ELSESCREEN
1,S:GOTO110
400 PMODEM,5:SCREEN1,S:PCLS:COLO
RM+1,1:CIRCLE(126,96),65
410 POKE178,N
420 PAINT(126,96),,M+1
430 LINE(10,10)-(70,40),PSET,BF
440 FOR J=0TO180STEP35:LINE(40+J
,180)-(255,180-J),PSET:NEXT
450 IFINKEY$=""THEN450ELSEGOTO60
0
600 FORZ=5TO1STEP-1
610 PMODEM,Z:SCREEN1,S:FORQ=1TO3
00:NEXTQ,Z
620 GOTO110
```




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We do pay for submissions, based on a number of criteria. Those wishing remuneration should *so state* when making submissions.

For the benefit of those who wish more detailed information on making submissions, please send a SASE to: Submissions Editor, *the RAINBOW*, P.O. Box 209, Prospect, KY 40059. We will send you some more comprehensive guidelines.

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A Personalized Certificate Can Reward Young Computerists

By Steve Blyn

The computer revolution has finally materialized in many schools and homes. Many children are involved in learning either computer literacy or basic computer programming. This article will present one way to reward these children for their efforts and accomplishments.

Rewards are a wonderful way of encouraging children to further learning. The rewards do not always have to be glamorous or expensive. Sometimes the simple is more effective than the complex. My three-year-old daughter would much rather receive a bag of 29 cent balloons than an expensive doll. (I know from past experience that I won't get away with that too much longer.) A certificate generated by the computer can perhaps similarly be more effective a reward than something bought by an adult in a store.

How are the children learning material about computers and programming? There are several fine possibilities. They can be using the manuals, a good text, or perhaps the teacher may have developed his/her own curriculum. Whichever the case may be, I'm sure that the long range aim is divided into certain steps or goals along the way. There are usually chapters or units to be mastered. When these steps are reached, the computer can generate a card or certificate to reward those particular accomplishments.

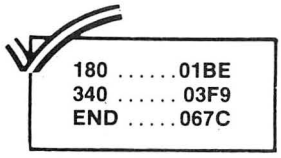
It is my suggestion that certain key expressions can be developed by your kids for their accomplishments. The expressions will have more meaning if the kids think of them on their own. A little contest to think up the best titles or expressions may be a good idea. Some of the suggestions from kids that I work with are: COMPUTER WIZARD, COMPUTER WIZZ, COMPUTER ACE WIZARD, COMPUWIZ, COMPUNUT, CHIPS 1, 2 or 3, FIRST, SECOND or THIRD CLASS OPERATOR. Of course, such titles only matter if they have some meaning and importance to the kids. The particular message or messages that you choose can be as individual as are the kids.

The certificate that I will illustrate is for the logo WIZARD. With a little doodling, you may change this to any other logo. You will need a printer to get a hard copy of the certificate. A low resolution and a high resolution program listing are given.

Any model printer that interfaces with any CoCo model will produce the low resolution version. Line 40 of the low res version asks if you have your printer turned on. If you enter "N" you will see the card on the screen. If you press "Y" you will get a printout of the card. Run the program as many times as you want to keep making cards. If you press "Y" and your printer is not on, then the computer will hang up. Don't panic: Either turn the printer on or turn the computer off and start again.

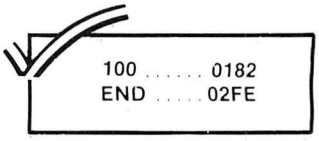
The high resolution version can be viewed on any Extended BASIC CoCo. A printer with graphics ability and a screen dump program are necessary to printout out this version. Lines 350—570 set up the strings to draw the necessary letters. Lines 70—320 draw out the certificate.

I hope that your children enjoy using these certificates. Both you and they will receive satisfaction in designing your own reward cards. We at Computer Island would love to see the results of your creations.



Listing 1:

```
10 REM"COMPUTER LICENSE"
20 REM"STEVE BLYN ,COMPUTER ISLA
ND,1983
30 CLEAR 1000
40 GOTO 360
50 PMODE 4,1:PCLS:SCREEN1,0:COLO
R7
60 REM"DRAW AND PAINT THE BORDER
"
70 LINE(5,5)-(250,185),PSET,B
80 LINE(10,10)-(245,180),PSET,B
90 LINE(15,15)-(240,175),PSET,B
100 PAINT(14,14),7,7
110 REM"DRAW THE WORDS"
120 DRAW "A2S8BM32,25"+C$+O$+M$+
P$+U$+T$+E$+R$
130 DRAWDD$+DD$+L$+I$+C$+E$+N$+S
$+E$
140 WI$=W$+I$+Z$+A$+R$+D$
150 DRAW"A2S16BM73,45"+WI$
160 DRAW"BM74,45"+WI$
170 DRAW"BM75,45"+WI$
180 REM"BOX THE WIZARD"
190 LINE(40,40)-(215,70),PSET,B
200 LINE(43,43)-(212,73),PSET,B
210 REM"DRAW THE REST OF THE WOR
DS"
220 DRAW"A2S4BM30,100"+T$+H$+I$+
S$+DD$:DRAWDD$+C$+E$+R$+T$+I$+F$
+I$+E$+S$
230 DRAWDD$+DD$+T$+H$+A$+T$
240 LINE(160,110)-(220,110),PSET
250 DRAW"A2S4BM30,120"+C$+A$+N$+
DD$+DD$+R$+E$+A$+D$+DD$
260 DRAW+DD$+A$+N$+D$+DD$+DD$+W$
+R$+I$+T$+E$
270 DRAW+DD$+DD$+I$+N$+DD$+DD$+B
$+A$+S$+I$+C$
280 PSET(225,125):REM"PERIOD"
290 DRAW"BM50,160"+D$+A$+T$+E$
300 LINE(35,155)-(85,155),PSET
310 DRAW"BM150,160"+A$+P$+P$+R$+
O$+V$+E$+D$+DD$+DD$+B$+Y$
320 LINE(140,155)-(220,155),PSET
330 REM"THE LETTERS ARE DRAWN OU
T HERE"
340 GOTO 340:REM"END OF PROGRAM"
350 REM"LETTERING BY J. KOLAR"
360 A$="BEHUNU2R4NU2DGL2BGBL6"
370 B$="BEHENR3HER3D4L3BGBL6"
380 C$="BU4ER2FD2GL2HBG2BL4"
390 D$="BEHU2ER3D4L3BGBL6"
400 E$="BER3U2NL2U2L4BG5BL2"
410 F$="BUR4U2NL3U2BG5BL5"
420 H$="BUU2NU2R4NU2D2BGBL9"
430 I$="BR2BUU4BU2BD7BL8"
440 L$="BU5R4D4BGBL9"
450 M$="BUNU4E2F2U4BG5BL5"
460 N$="BUU4F4U4BG5BL5"
470 O$="BEHU2ER2FD2GL2BGBL6"
480 P$="BER3U2NU2L3GNFBG2BL4"
490 R$="BEHERNH2R2NU2D2L3BGBL6"
500 S$="BU2FR2EHL2HER2FBG4BL6"
510 T$="BUR2NU4R2BDBL10"
520 U$="BUU3ER2FD3BGBL9"
530 V$="BUU2E2F2D2BGBL9"
540 W$="BUU4F2E2D4BGBL9"
550 Y$="BUE2NU2F2BGBL9"
560 Z$="BUNR4E4L4BG4BDBL2"
570 DD$="BE4BUBG5BL5"'SPACER
580 GOTO 50
```



Listing 2:

```
10 REM"COMPUTER LICENSE LOW RES"
20 REM"STEVE BLYN,COMPUTER ISLAN
D"
30 CLS
40 PRINT@0,"DO YOU HAVE A PRINTE
R TURNED ON":INPUT A$
50 IF LEFT$(A$,1)="Y" THEN K=-2
ELSE IF LEFT$(A$,1)="N" THEN K=0
 ELSE 40
60 PRINT#K,"  ------------------
----------"
70 PRINT#K,"!      COMPUTER    LI
CENSE      !"
80 PRINT#K,"!      **************
*****      !"
90 PRINT#K,"!      ****   WIZARD
  ***      !"
100 PRINT#K,"!      ************
******     !"
110 GOSUB 220
120 PRINT#K,"!    THIS CARD CERTI
FIES THAT   !"
130 GOSUB220
140 PRINT#K,"!                  I
S ABLE TO   !"
150 PRINT#K,"!    --------------
            !"
160 PRINT#K,"!    READ AND WRITE
IN BASIC.   !"
170 GOSUB 220
180 PRINT#K,"!    -------     ----
--------    !"
190 PRINT#K,"!     DATE       APPR
OVED BY     !"
200 PRINT#K,"  ------------------
-----------"
210 GOTO 210
220 PRINT#K,"!
            !":RETURN
```

Direct Graphic Design

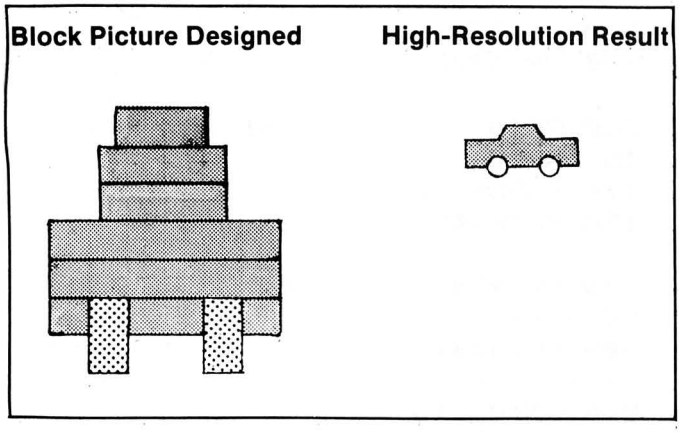
By Don Inman
Rainbow Contributing Editor

This handy tool allows you to 'design graphic figures directly on the screen.'

This month's article borrows a program that appeared in "Assembly Language Graphics" by Don and Kurt Inman. My son, Kurt, wrote the program in two versions—one in Extended Color BASIC and one in 6809 Assembly Language. A modification of his BASIC program is presented here.

In many past articles and in most of my books, I have designed graphic figures on paper before writing computer programs to produce them on the screen. Kurt's program takes a different approach. It allows you to design graphic figures directly on the screen. When a final version is ready, the program provides you with the data necessary to produce the figure. This data can be used in any program that requires that figure.

The figure is designed in the text mode using block graphics on a 12 x 8 grid which is placed at the center of the screen. The color blocks in the grid are converted from BASIC color codes to hexadecimal data bytes that are *POKEd* into the graphics screen area. The conversion from the rectangular blocks on the text screen to colored pixels on the high-resolution graphics screen does not produce a one-to-one correspondence.



To aid in the development of the final picture, the program allows you to go back and forth between your experimental blocks and the results produced in high-resolution.

As the program begins, the title appears at the top of the screen. The color set and drawing color are shown at the right of the grid. A cursor is placed at the upper left position inside the 12 x 8 grid. The command prompt appears at the bottom left of the screen.

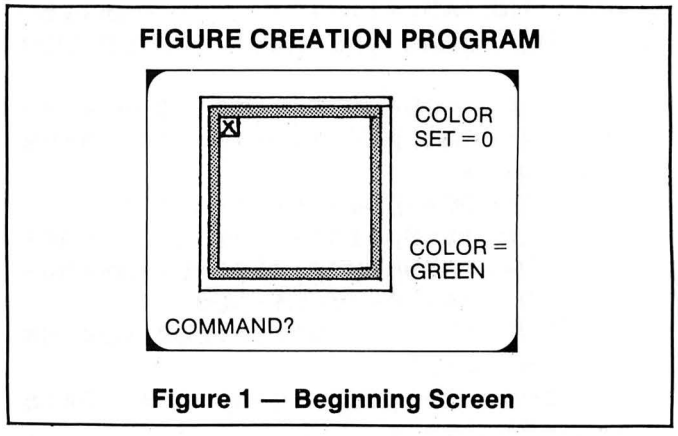


Figure 1 — Beginning Screen

The colors that are used in the experimental block mode are those of *PMODE 3*.

Color Set 0	Color Set 1
1 = green	5 = buff
2 = yellow	6 = cyan
3 = blue	7 = magenta
4 = red	8 = orange

Table 1 — Colors Used

(Don Inman is the acknowledged master of microcomputer graphics and the author of a large number of books, including "TRS-80 Color Computer Graphics and Assembly Language Graphics for the TRS-80 Color Computer" with Kurt Inman.)

The following one-key commands are used to create the figures.

	Typed Symbol	Command
1	↑	move cursor up
2	↓	move cursor down
3	←	move cursor left
4	→	move cursor right
5	C	change draw color
6	S	change color set
7	<space>	set block where cursor is located
8	—	erase block where cursor is located
9	D	display data table
10	T	test (draw figure in PMODE 3)
11	R	restart with a clear grid

Table 2 — Graphic Creator Commands

The first four commands (↑, ↓, ←, →) are used to move between blocks of the grid. The fifth and sixth commands (C and S) are used to select the drawing color and the color set used. If you desire to color a block, the space bar is pressed. If you change your mind and wish to erase a colored block, press the dash (—).

The last two commands (T and R) are used to either start over with a clear grid or to leave the text mode and go to the high-resolution 4-color graphics mode to view the results, whether temporary or final.

When you have decided on the final figure, the ninth command (D) will display a table of the data bytes which can be *POKEd* into the graphic screen's addresses to produce the high-resolution figure. The data may be saved and used in some future BASIC program.

SCREEN DATA

ADDRESS	DATA BYTES (HEX)
XXXX + 00	00 00 00
XXXX + 32	00 00 00
XXXX + 64	00 00 00
XXXX + 96	00 00 00
XXXX + 128	00 00 00
XXXX + 160	00 00 00
XXXX + 192	00 00 00
XXXX + 224	00 00 00

HIT ENTER TO RETURN TO GRID

Figure 2 — Data Byte Screen Format

Any value within the screen area may be chosen for XXXX as the display address. The data bytes from your drawing will replace the zeros shown in this diagram

Three arrays are used. G is a 12 x 8 array that holds the color code for each cell of the block drawing.

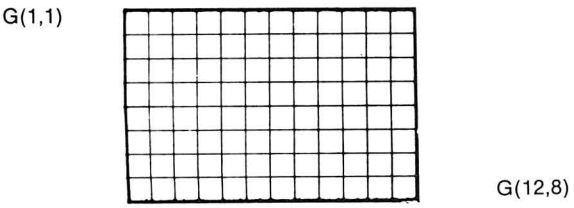


Figure 3 — Grid for Experimental Drawing

M is a 3 x 8 array that holds the data bytes (see Figure 2) generated to create the high-resolution drawing. C$ is a nine-element single dimension array that holds the nine color names used for the border of the grid and the blocks of the experimental drawing.

Five variables are used.

Variable	Function
CS	color set (0 or 1)
CC	current drawing color code (1—4 or 5—8)
OC	old color (color code saved under cursor)
CX	X-position of cursor (1—12)
CY	Y-position of cursor (1—8)

Program by Modular Functions

The program is broken into 15 functional modules. This makes the program easier to understand and easier to explain. The program will be shown and explained by modules. The complete program appears at the end of the article. This program could be written more efficiently, but it is presented in this form so that the similarities and differences of the functional modules can be easily seen.

Module 1 (lines 100—199) — Dimension, Read and Assign

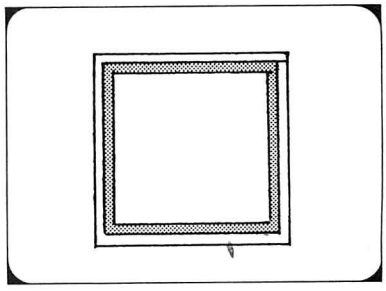
The arrays are dimensioned in line 110. Line 120 fills array C$ by reading the data of line 130. Line 140 sets the original conditions: color set = 0, current drawing color = green, old color = green, cursor in position (1,1) of the grid. Lines 150—170 read the old color code into each element of the grid array (see Figure 3).

```
100 REM * DIMENSION, READ, AND A
SSIGN
110 DIM G(12,8),M(2,7),C$(8)
120 RESTORE: FOR X=0 TO 8: READ
C$(X):NEXT X
130 DATA BLACK,GREEN,YELLOW,BLUE
,RED,BUFF,CYAN,MAGENTA,ORANGE
140 CS=0:CC=1:OC=1:CX=1:CY=1
150 FOR X=1 TO 12: FOR Y=1 TO 8
160 G(X,Y)=OC
170 NEXT Y,X
199 '
```

Module 2 (lines 200—299) — Draw Borders

Line 210 prints the title. Lines 220—240 draw the top and bottom of the grid's border. Lines 250—270 draw the sides. Lines 280 and 290 draw the four corners.

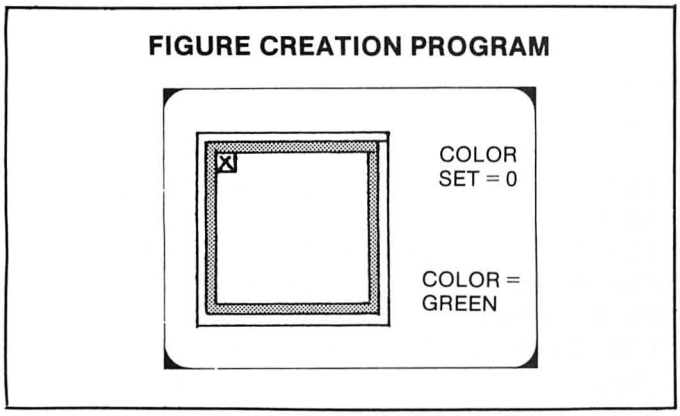
FIGURE CREATION PROGRAM



```
200 REM * DRAW BORDERS *
210 CLS: PRINT@4,"FIGURE CREATIO
N PROGRAM";
220 FOR X=0 TO 12
230 PRINT@106+X,CHR$(156);:PRINT
@394+X,CHR$(147);
240 NEXT X
250 FOR Y=0 TO 7
260 PRINT@128+9+32*Y,CHR$(154);
270 PRINT@128+22+32*Y,CHR$(149);
:NEXT Y
280 PRINT@105,CHR$(158);:PRINT@1
18,CHR$(157);
290 PRINT@393,CHR$(155);:PRINT@4
06,CHR$(151);
299 '
```

Module 3 (lines 300—399) — Display Array

A subroutine (at line 5010) is called at line 310 to fill in the grid with color, provide color data, and print the cursor. The subroutine provides the original picture and updates of any color changes.




```
300 REM * DISPLAY *
310 GOSUB 5010
399 '
```

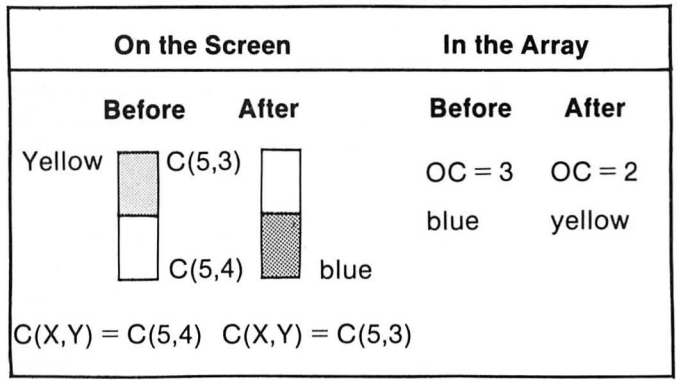
Module 4 (lines 400—499) — Get Command

Line 410 prints, or reprints, the command prompt and erases the OLC command. Line 420 provides for the input of a new command (see Table 2). When starting the program, the screen at this point looks like the diagram in Figure 1.

```
400 REM * GET COMMAND *
410 PRINT@449,"COMMAND?";STRING$
(15," ");
420 A$=INKEY$:IF A$="" THEN 420
499 '
```

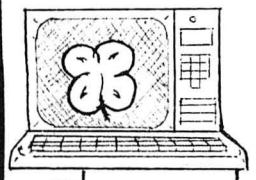
Module 5 (lines 500—599) — Up-Arrow

Line 510 tests to see if an up-arrow command has been given. If not, program control is passed to Module 6 at line 610. If an up-arrow has been pressed, line 520 checks to make sure that the cursor position is not in the top row. If it is, the cursor cannot move up or it will leave the grid. In that case, the command is rejected, and control returns to Module 4 for a valid command. If the cursor can move up, line 530 updates the variables. The old color code is placed in the current grid block, and the cursor's Y coordinate is decreased. The old color of the new block is saved in the new grid position. Line 540 then prints the cursor in the new position. Line 550 restores the old color of the previous position, thus erasing the cursor from that position.



After the cursor has been moved and the old color restored, control is passed to Module 4 for a new command.

```
500 REM * UP-ARROW *
510 IF A$<>"^" THEN 610
520 IF CY-1<1 THEN 410
530 G(CX,CY)=OC:CY=CY-1:OC=G(CX,
CY)
540 PRINT@138+32*(CY-1)+(CX-1),"
X"; ← an inverted X
550 PRINT@138+32*(CY)+(CX-1),CHR
$((G(CX,CY+1)-1)*16+143);:GOTO 4
10
599
```



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The **STEREO COMPOSER** music synthesizer was developed for the true music lover. All the features available for the **COMPOSER** described below are also available for the **STEREO COMPOSER**. However, instead of using the single 6 bit digital to analog converter built into the computer and the speaker built into your TV, the **STEREO COMPOSER** uses two 8 bit digital to analog converters which drive two audio power amplifiers. These amplifiers supply enough audio power to easily drive your own external speakers. If you like, the output may be connected to your home stereo system to further increase fidelity. Connection is provided by two phono connectors. If the music is too loud, two built-in volume controls are provided to allow you to control the volume of each of the channels separately. The advantage of being able to use external high quality speakers is obvious. The use of higher quality digital to analog converters serves to further increase music fidelity.

The **STEREO COMPOSER** produces music in stereo. Of the 4 voices produced, 2 are directed to each channel. This ability alone increases the realism of the music. You can even move the voices between speakers as the music plays.

The **STEREO COMPOSER** comes assembled, tested, burned in, with all the software and hardware to allow you to immediately start enjoying your music. A complete manual and examples are provided to give you everything you need.

The **STEREO COMPOSER** is completely compatible with the Radio Shack disk system. Any expansion unit will allow you to have both a disk and the **STEREO COMPOSER** operating.

Requires Extended BASIC and Minimum of 16K

STEREO COMPOSER (Hardware, Cassette and Disk) $89.95

THE COMPOSER

The **COMPOSER** is a 4 voice music compiler which easily allows one to develop high quality music. Each voice is programmed separately. In addition, each voice uses its own waveshape table which means a unique sound for each of the 4 voices.

The **COMPOSER** features a 7 octave range. It supports dotted and double dotted notes as well as eighth, quarter, and standard triplet notes. Sixteenth and thirty second notes are also supported.

The **COMPOSER** allows the music to be played at any tempo and in any key. And believe it or not, the tempo and key can be modified as the music plays. This gives the user tremendous versatility in developing music. Key modification also allows the user to move the music up or down one or more octaves.

The **COMPOSER** displays a constantly changing random kaleidoscope pattern as the music plays. In addition, the number of the note being played is displayed which aids one in finding sour notes during music development. Both of these displays can be disabled to allow any screen to be displayed while the music is playing. In this way, one can show the words to a song or display a picture as the music plays.

The **COMPOSER** develops a machine language position independent subroutine that can be Saved, Loaded, and Executed independent of all other software. This means that you can share your music with friends. In fact, you can write your own BASIC programs that call and play the music. Software vendors may include the music in their own product.

The **COMPOSER** is menu driven making it extremely easy and friendly to use and operate. A thick operating manual is provided as well as 20 minutes of music. Many examples are given to aid the user in getting started. All you need is provided, no additional hardware is necessary. Don't let the price fool you, the **COMPOSER** has got to be heard to be appreciated. For reviews see June '83 *RAINBOW*, p. 192 and May '83 *Color Computer News*, p. 74.

Requires Extended BASIC and Minimum of 16K

CASSETTE VERSION $24.95
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THE VOICE



WHY PAY $100 OR $150 FOR A SPEECH SYNTHESIZER?

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THE VOICE is a hardware synthesizer that plugs into the cartridge slot. It uses a sophisticated integrated circuit, the SC-01 by VOTRAX, to reproduce any word in English as well as other languages using phonemes. Phonemes are basic units of speech of which 64 are available at 4 inflections. This chip costs us $55. If you supply the chip, deduct $55.

THE VOICE has two outputs. Speech may be heard through the TV speaker, or the built-in audio power amplifier may be connected to your own external speaker. If the volume is too high, a built-in volume control is provided.

THE VOICE comes assembled, tested, burned in, with all the necessary hardware and software. A complete manual with many examples is provided to get you started in developing your own programs.

THE VOICE is completely compatible with the Radio Shack disk system. Any expansion unit will allow you to have both a disk and **THE VOICE** operating.

Software Included With THE VOICE

BINGO The VOICE announces the BINGO titles while you play the game.
MATH TUTOR The VOICE tutors your child in learning arithmetic.
HIGH LOW The VOICE gives you hints in guessing a number it has picked.
EDITOR This utility program will help you develop words phonetically.

THE VOICE (Hardware, Cassette, and Disk) $149.95
THE VOICE (As above without SC-01) ..... $ 94.95

THE TRANSLATOR

The translator is a machine language program that uses a built-in dictionary and a sophisticated program algorithm developed by Del Software to automatically convert text to speech. For example, A$ "THIS IS ALMOST TOO EASY" followed by calling a USR will allow the VOICE to speak. The translator will even allow you to type words in one language (i.e. French) and have the VOICE speak in another (i.e. German). Nobody else gives you that flexibility. For 16K, 32K and 64K machines.

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Module 6 (lines 600—699) — Down-Arrow

This module performs in a similar manner as Module 5 except for the down-arrow. The cursor is moved down one row.

```
600 REM * DOWN-ARROW *
610 IF A$<>CHR$(10) THEN 710
620 IF CY+1>8 THEN 410
630 G(CX,CY)=OC:CY=CY+1:OC=G(CX,
CY)
640 PRINT@138+32*(CY-1)+(CX-1),"
[X]";  <- inverted X
650 PRINT@138+32*(CY-2)+(CX-1),C
HR$((G(CX,CY-1)-1)*16+143);:GOTO
 410
699 '
```

Module 7 (lines 700—799) — Left-Arrow

Performs in a similar manner to Modules 5 and 6 except for the left-arrow. The cursor is moved left one column.

```
700 REM * LEFT-ARROW *
710 IF A$<>CHR$(8) THEN 810
720 IF CX-1<1 THEN 410
730 G(CX,CY)=OC:CX=CX-1:OC=G(CX,
CY)
740 PRINT@138+32*(CY-1)+(CX-1),"
[X]";  <- inverted X
750 PRINT@138+32*(CY-1)+CX,CHR$(
(G(CX+1,CY)-1)*16+143);:GOTO 410
799 '
```




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```
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10 'LINE PRINTER VII DUMP
10 'LINE PRINTER VII DUMP
```

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Module 8 (lines 800—899) — Right-Arrow

Performs in a similar manner to Modules 5, 6 and 7 except for the right-arrow. The cursor is moved one column to the right.

```
800 REM * RIGHT-ARROW *
810 IF A$<>CHR$(9) THEN 910
820 IF CX+1>12 THEN 410
830 G(CX,CY)=OC:CX=CX+1:OC=G(CX,
CY)
840 PRINT@138+32*(CY-1)+(CX-1),"
[X]";  <- inverted X
850 PRINT@138+32*(CY-1)+(CX-2),C
HR$((G(CX-1,CY)-1)*16+143);:GOTO
 410
899 '
```

Module 9 (lines 900—999) — Other Commands

If none of the arrow commands have been pressed, this module looks for other requests. Line 910 checks for a space (change drawing color). If it has been pressed, the current color code replaces the old color of the block where the cursor exists. Control is passed to Module 4 for a new command.

Line 920 checks for a dash (erase old color). If pressed, the old color code is replaced by either 1 (green) or 5 (buff) depending upon which color set is being used. Control is passed to Module 4 for a new command.

Line 930 checks for the letter R (restart). If pressed, control is passed to the beginning of the program where a clear grid is provided for a new start.

Lines 940 through 970 test for change of color set (S), change of color (C), test (T), and display data (D). Control is passed to the appropriate module to perform the command.

Line 980 provides a final check. If an invalid command key has been pressed, control is returned to Module 4 for another attempt at a valid command.

```
900 REM * OTHER COMMANDS *
910 PRINT@458,A$;:IF A$=" " THEN
 OC=CC:GOTO 410
920 IF A$="-" THEN OC=4*CS+1:GOT
O 410
930 IF A$="R" THEN 120
940 IF A$="S" THEN 1010
950 IF A$="C" THEN 1110
960 IF A$="T" THEN 1210
970 IF A$="D" THEN 1310
980 GOTO 410
999 '
```

Module 10 (lines 1000—1099) — Change Color Set

Line 1010 changes the old color and the current color to corresponding values in the new color set:

(1) green	<----->	(5) buff
(2) yellow	<----->	(6) cyan
(3) blue	<----->	(7) magenta
(4) red	<----->	(8) orange

Lines 1020—1040 change all color codes in the grid array to those of the corresponding values of the new color set.

Line 1050 changes the color set value and passes control to Module 3 to update the display with the new colors.

```
1000 REM * CHANGE COLORSET,VARIA
BLES, AND ARRAY *
1010 OC=-CS*8+OC+4:CC=-CS*8+CC+4
1020 FOR X=1 TO 12:FOR Y=1 TO 8
1030 G(X,Y)=-CS*8+G(X,Y)+4
1040 NEXT Y,X
1050 CS=1-CS:GOTO 310
1099 '
```

Module 11 (lines 1100—1199) — Change Drawing Color

Line 1110 prompts for the new drawing color code, and line 1120 checks for the input. Line 1130 checks for a valid code. Line 1140 converts the ASCII input value into the appropriate color code. Lines 1140 and 1150 insure that a valid value is input. Line 1160 places the value (if valid) into the current color variable (CC) and passes control to Module 3.

```
1100 REM * CHANGE COLOR *
1110 PRINT@449,"TYPE NEW COLOR C
ODE:   ";
1120 C$=INKEY$:IF C$="" THEN 112
0
1130 PRINT@470,C$;:IF C$<"1" OR
C$>"8" THEN 1110
1140 C=VAL(C$):IF CS=0 AND C>4 T
HEN 1110
1150 IF CS=1 AND C<5 THEN 1110
1160 CC=C:GOTO 310
1199 '
```

Module 12 (lines 1200—1299) — Test on Real Display

Line 1210 sets the high-resolution, 4-color graphic mode. Line 1220 calls a subroutine (at 4010) that converts the color code values of the block figure into appropriate hexadecimal codes that can produce the high-resolution drawing. These codes are placed in array M. Lines 1230—1250 *POKE* the values from the M array onto the high-resolution screen. Line 1260 provides an *INKEY$* function to keep the picture on the screen as long as desired. Pressing any key passes control to Module 4 for further development of your picture on the block grid.

```
1200 REM * TEST ON REAL DISPLAY
*
1210 PMODE 3,1:SCREEN 1,CS:PCLS
1220 GOSUB 4010
1230 FOR X=0 TO 2:FOR Y=0 TO 7
1240 POKE 3072+14+X+32*Y,M(X,Y)
1250 NEXT Y,X
1260 C$=INKEY$:IF C$="" THEN 126
0
1270 PCLS:SCREEN 0,0:GOTO 410
1299 '
```

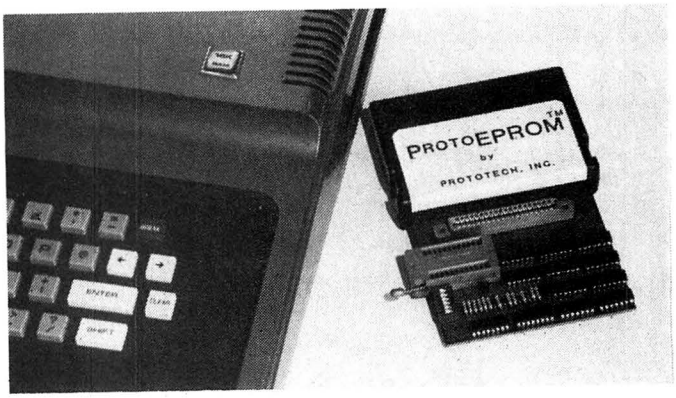
Module 13 (lines 1300—1399) — Display Figure Bytes

Line 1310 calls the subroutine (at line 4010) that calculates the data bytes that produce the high-resolution drawing. Line 1320 prints a heading for the table of data bytes. Lines 1330—1380 put the values into tabular form. Line 1390 prints a prompt telling how to return to the experimental grid.

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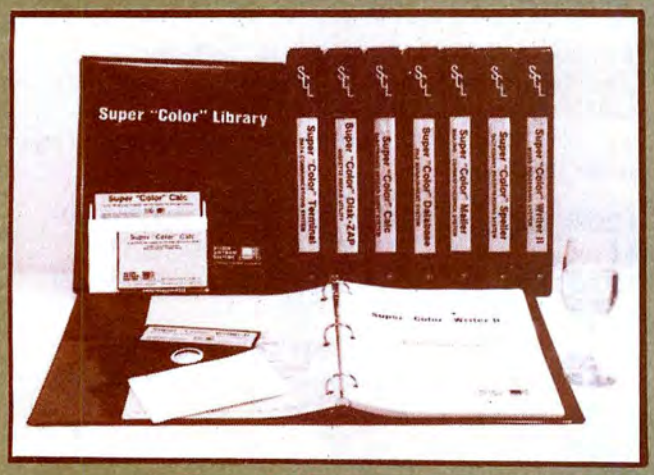


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WE TAKE THE COLOR COMPUTER SERIOUSLY.

AUTHORS' SUBMISSIONS ARE ENCOURAGED.

```
1300 REM *DISPLAY FIGURE BYTES *
1310 GOSUB 4010
1320 CLS:PRINT"POKE ADDRESS     D
ATA BYTES (HEX)":PRINT
1330 FOR Y=0 TO 7
1340 PRINT"XXXX+";Y*32;TAB(16);
1350 FOR X=0 TO 2:H$=HEX$(M(X,Y)
)
1360 IF LEN(H$)=1 THEN H$="0"+H$
1370 PRINT H$;" ";
1380 NEXT X:PRINT:NEXT Y:PRINT
1390 INPUT"HIT ENTER TO RETURN T
O GRID";H$:GOTO 210
1399 '
```

Module 14 (lines 4000—4099) — Create Display Array

Line 4010 opens a loop in which lines 4020—4040 calculate the hexadecimal data bytes. Line 4050 places the bytes in array M. Line 4060 closes the loop, and line 4070 returns control to the main program.

```
4000 REM * CREATE DISPLAY ARRAY
*
4010 FOR Y1=1 TO 8:FOR X1=0 TO 2
4020 X2=1:IF C$=1 THEN X2=5
4030 A1=G(X1*4+1,Y1)-X2:A2=G(X1*
4+2,Y1)-X2
4040 A3=G(X1*4+3,Y1)-X2:A4=G(X1*
4+4,Y1)-X2
4050 M(X1,Y1-1)=A1*64+A2*16+A3*4
+A4
4060 NEXT X1,Y1
4070 RETURN
4099 '
```

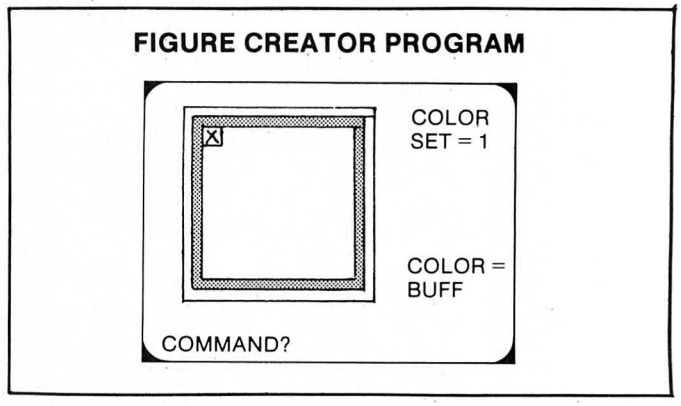
Module 15 (lines 5000—5099) — Inside of Grid

Lines 5010—5030 print the individual colored blocks of the experimental drawing grid. Lines 5040—5060 place the current color information on the screen. Line 5070 returns control to the main program.

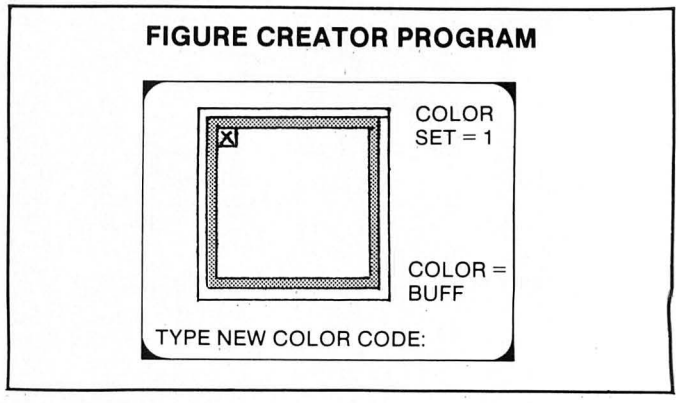
```
5000 REM * INSIDE OF GRID *
5010 FOR Y1=1 TO 8: FOR X1=1 TO
12
5020 PRINT@138+32*(Y1-1)+(X1-1),
CHR$((G(X1,Y1)-1)*16+143);
5030 NEXT X1,Y1
5040 PRINT@120,"COLOR";:PRINT@15
2,"SET=";C$;
5050 PRINT@248,"COLOR=";:PRINT@2
80,"       ";:PRINT@280,C$(CC);
5060 PRINT@138+32*(CY-1)+(CX-1),
"X";
5070 RETURN
5099 '
9999 END
```

Sample Program Use

I first selected color set 1 using the command S.



Next, I changed the drawing color by using the command C.



A 3 was typed, and the lower-right information changed to COLOR = MAGENTA. The command prompt came back on (COMMAND?) in place of the prompt to type the new color code.

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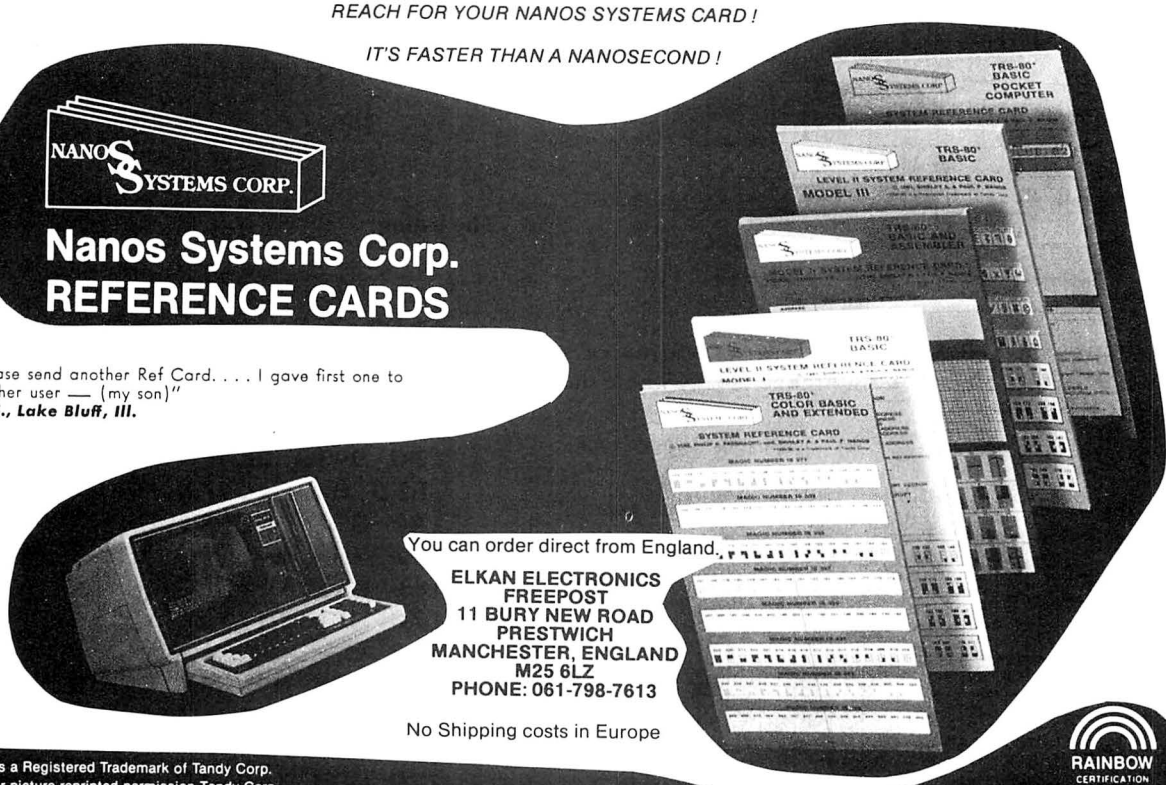
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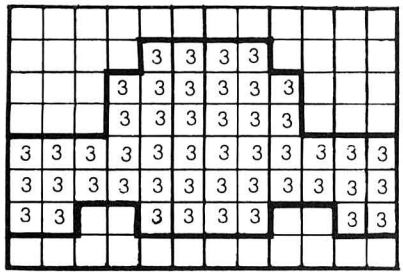
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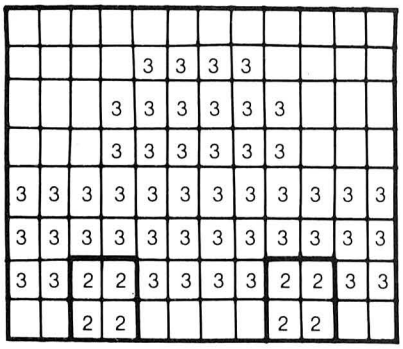
I then moved the cursor around with the arrow keys and used the space bar where the threes appear in Figure 3.

Figure 3 — Partial Block Design



The color was then changed to orange, and the arrow keys and space bar were used to fill in orange blocks where the twos appear in Figure 4.

Figure 4 — Finished Block Design



Any corrections can be made by using the arrow keys with the dash to erase errors or a new drawing color to replace one color block with another.

Try using the program to create the same pattern as in Figure 4. When all finished, press T to see how the pattern looks in high-resolution. Then go back to the grid. Press D to see the data bytes which could be *POKEd* into any area of screen memory to produce the high-resolution result. Figure 5 shows the data bytes produced by the design of Figure 4.

SCREEN DATA

ADDRESS	DATA BYTES (HEX)
XXXX + 00	00 00 00
XXXX + 32	00 AA 00
XXXX + 64	02 AA 80
XXXX + 96	02 AA 80
XXXX + 128	AA AA AA
XXXX + 160	AA AA AA
XXXX + 192	A5 AA 5A
XXXX + 224	05 00 50

HIT ENTER TO RETURN TO GRID

Next month I'll show how to use several shapes that were created by this program in a BASIC program with lots of movement.

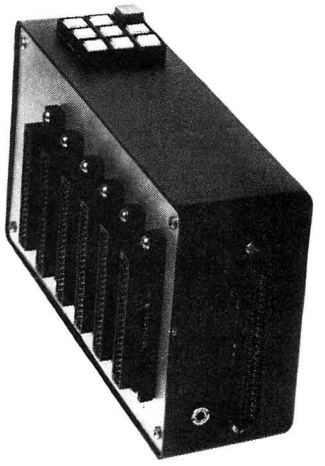
```
310 .....021A
720 .....043C
1050 .....06FB
1390 .....097B
END .....0B61
```

The listing:

```
100 REM * DIMENSION, READ, AND A
SSIGN
110 DIM G(12,8),M(2,7),C$(8)
120 RESTORE: FOR X=0 TO 8: READ
C$(X):NEXT X
130 DATA BLACK,GREEN,YELLOW,BLUE
,RED,BUFF,CYAN,MAGENTA,ORANGE
140 CS=0:CC=1:OC=1:CX=1:CY=1
150 FOR X=1 TO 12: FOR Y=1 TO 8
160 G(X,Y)=OC
170 NEXT Y,X
199 '
200 REM * DRAW BORDERS *
210 CLS: PRINT@4,"FIGURE CREATIO
N PROGRAM";
220 FOR X=0 TO 12
230 PRINT@106+X,CHR$(156);:PRINT
@394+X,CHR$(147);
240 NEXT X
250 FOR Y=0 TO 7
260 PRINT@128+9+32*Y,CHR$(154);
270 PRINT@128+22+32*Y,CHR$(149);
:NEXT Y
280 PRINT@105,CHR$(158);:PRINT@1
18,CHR$(157);
290 PRINT@393,CHR$(155);:PRINT@4
06,CHR$(151);
299 '
300 REM * DISPLAY *
310 GOSUB 5010
399 '
400 REM * GET COMMAND *
410 PRINT@449,"COMMAND?";STRING$
(15," ");
420 A$=INKEY$:IF A$="" THEN 420
499 '
500 REM * UP-ARROW *
510 IF A$<>"^" THEN 610
520 IF CY-1<1 THEN 410
530 G(CX,CY)=OC:CY=CY-1:OC=G(CX,
CY)
540 PRINT@138+32*(CY-1)+(CX-1),"
x";
550 PRINT@138+32*(CY)+(CX-1),CHR
$((G(CX,CY+1)-1)*16+143);:GOTO 4
10
```

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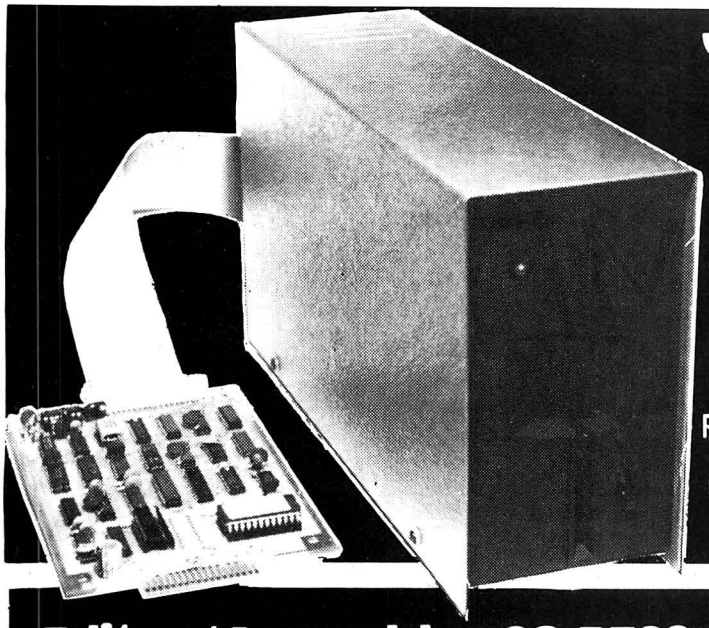
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```
599 '
600 REM * DOWN-ARROW *
610 IF A$<>CHR$(10) THEN 710
620 IF CY+1>8 THEN 410
630 G(CX,CY)=OC:CY=CY+1:OC=G(CX,
CY)
640 PRINT@138+32*(CY-1)+(CX-1),"
x";
650 PRINT@138+32*(CY-2)+(CX-1),C
HR$((G(CX,CY-1)-1)*16+143);:GOTO
 410
699 '
700 REM * LEFT-ARROW *
710 IF A$<>CHR$(8) THEN 810
720 IF CX-1<1 THEN 410
730 G(CX,CY)=OC:CX=CX-1:OC=G(CX,
CY)
740 PRINT@138+32*(CY-1)+(CX-1),"
x";
750 PRINT@138+32*(CY-1)+CX,CHR$(
(G(CX+1,CY)-1)*16+143);:GOTO 410
799 '
800 REM * RIGHT-ARROW *
810 IF A$<>CHR$(9) THEN 910
820 IF CX+1>12 THEN 410
830 G(CX,CY)=OC:CX=CX+1:OC=G(CX,
CY)
840 PRINT@138+32*(CY-1)+(CX-1),"
x";
850 PRINT@138+32*(CY-1)+(CX-2),C
HR$((G(CX-1,CY)-1)*16+143);:GOTO
 410
899 '
900 REM * OTHER COMMANDS *
910 PRINT@458,A$;:IF A$=" " THEN
 OC=CC:GOTO 410
920 IF A$="-" THEN OC=4*CS+1:GOT
O 410
930 IF A$="R" THEN 120
940 IF A$="S" THEN 1010
950 IF A$="C" THEN 1110
960 IF A$="T" THEN 1210
970 IF A$="D" THEN 1310
980 GOTO 410
999 '
1000 REM * CHANGE COLORSET,VARIA
BLES, AND ARRAY *
1010 OC=-CS*8+OC+4:CC=-CS*8+CC+4
1020 FOR X=1 TO 12:FOR Y=1 TO 8
1030 G(X,Y)=-CS*8+G(X,Y)+4
1040 NEXT Y,X
1050 CS=1-CS:GOTO 310
1099 '
1100 REM * CHANGE COLOR *
1110 PRINT@449,"TYPE NEW COLOR C
ODE:   ";
1120 C$=INKEY$:IF C$="" THEN 112
0
1130 PRINT@470,C$;:IF C$<"1" OR
C$>"8" THEN 1110
1140 C=VAL(C$):IF CS=0 AND C>4 T
HEN 1110
1150 IF CS=1 AND C<5 THEN 1110
1160 CC=C:GOTO 310
1199 '
1200 REM * TEST ON REAL DISPLAY
*
1210 PMODE 3,1:SCREEN 1,CS:PCLS
1220 GOSUB 4010
1230 FOR X=0 TO 2:FOR Y=0 TO 7
1240 POKE 3072+14+X+32*Y,M(X,Y)
1250 NEXT Y,X
1260 C$=INKEY$:IF C$="" THEN 126
0
1270 PCLS:SCREEN 0,0:GOTO 410
1299 '
1300 REM *DISPLAY FIGURE BYTES *
1310 GOSUB 4010
1320 CLS:PRINT"POKE ADDRESS    D
ATA BYTES (HEX)":PRINT
1330 FOR Y=0 TO 7
1340 PRINT"XXXX+";Y*32;TAB(16);
1350 FOR X=0 TO 2:H$=HEX$(M(X,Y)
)
1360 IF LEN(H$)=1 THEN H$="0"+H$
1370 PRINT H$;" ";
1380 NEXT X:PRINT:NEXT Y:PRINT
1390 INPUT"HIT ENTER TO RETURN T
O GRID";H$:GOTO 210
1399 '
4000 REM * CREATE DISPLAY ARRAY
*
4010 FOR Y1=1 TO 8:FOR X1=0 TO 2
4020 X2=1:IF CS=1 THEN X2=5
4030 A1=G(X1*4+1,Y1)-X2:A2=G(X1*
4+2,Y1)-X2
4040 A3=G(X1*4+3,Y1)-X2:A4=G(X1*
4+4,Y1)-X2
4050 M(X1,Y1-1)=A1*64+A2*16+A3*4
+A4
4060 NEXT X1,Y1
4070 RETURN
4099 '
5000 REM * INSIDE OF GRID *
5010 FOR Y1=1 TO 8: FOR X1=1 TO
12
5020 PRINT@138+32*(Y1-1)+(X1-1),
CHR$((G(X1,Y1)-1)*16+143);
5030 NEXT X1,Y1
5040 PRINT@120,"COLOR";:PRINT@15
2,"SET=";CS;
5050 PRINT@248,"COLOR=";:PRINT@2
80,"       ";:PRINT@280,C$(CC);
5060 PRINT@138+32*(CY-1)+(CX-1),
"x";
5070 RETURN
5099 '
9999 END
```



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GLOMMER: True Graphics for 4K

By David Dawson

If you have a Non-Extended BASIC Color Computer and have been frustrated in your attempts to write graphics programs, this article should help. The program presented and described here will even work on a 4K computer as the display only requires 512 extra bytes, leaving a reasonable amount of memory on any system for program storage. Routines presented can also be adapted, and described techniques applied, to assist in the development of new programs.

In the following, I will present and explain a program that uses the 64 x 64 four color graphics mode that is unsupported by Extended Color BASIC. This mode has the advantages of being a true graphics mode (all dots are independent, unlike the semigraphics modes) and uses the least memory of any of the four color modes—which means 4K computers can use it, too.

This program was designed to use the memory directly below the text screen so it is not recommended for use with the disk drives unless the display memory is moved by changing the *POKEs* in line 70. But doing so will reduce the memory savings, as you will see.

Reserving Graphics Memory

Extended Color BASIC locates graphics memory separate from text screen memory. For many programs, this means 512 trapped bytes during graphics display. With a cassette system this is not necessary and using text memory would reduce the 1024 bytes required for graphics display of the four color mode used here to 512 bytes. The display could quickly be cleared when the text screen is required again as is also demonstrated in the *Glommer* program.

(David Dawson is a teaching assistant at the University of Nebraska at Omaha and is working on his master's in psychology. He has a wife, Leigh Anne, and a son, Adam.)

The problem is how to tell BASIC that the 512 bytes below the text screen are needed for graphics. This is easily solved by *POKEing* the BASIC program pointers to a point below the graphics memory required.

By *POKEing* the most significant byte of the top of BASIC program pointer (location 25) with 6, the pointer is located right below the text screen memory. This is because each addition of one to location 25 moves the pointer down 256 bytes. Thus, 6 x 256 = 1536 or the pointer points to byte 1536 which is the first byte below the text screen. Another 512 bytes are needed for mode G1C used in *Glommer*, so, if two is added (2 x 256 = 512) and *POKE25,8* ENTER is used, any program will be loaded just below the graphics memory needed by mode G1C.

Two problems may appear when using this. First, a syntax error will appear when *RUN* or several other commands are used. This is because BASIC requires that the first byte of program memory be a zero. To cure this, type:

POKE(PEEK(25)*256),0 ENTER

Second, some garbage will probably be present in the memory now intended for storage of BASIC program lines. Always type: *NEW* ENTER after moving the pointer.

All of this must be done before any program is loaded or typed in. Use the commands listed in the opening remarks of *Glommer* before you begin typing it in and each time it is loaded. Extended BASIC reserves 6K on power-up so *Glommer* will work without the *POKEs* and *NEW* command. This technique is still useful in reserving less graphics memory than Extended BASIC allows.

Go To Graphics

The *POKEs* necessary to select various graphics modes and starting pages are given in the Color BASIC manual so I will not discuss them here. By changing line 60 alone, any mode can begin using the text screen memory. Make sure to *POKE* or *PCLEAR* enough memory for display. If you wish to use the mode used for *Glommer* in your own program, lines 60, 70 and 80 can be lifted out and used (see Table 1).

Line 40 can also be taken out and used any time the text screen is needed. Routines for clearing the screen, checking the keyboard and checking for player hit (see Table 1) can also be removed and used in other programs once certain variables are considered.

Table 1

Subsections of Glommer Program

Line	Function
40	Go to text screen
60	Set graphics mode
70	Set start of graphics memory
80	Choose color set
90	Clear graphics screen
300	Check keyboard
350	Check for creature near

Drawing Objects

In mode G1C, as well as the other four color modes, two bits specify the color of each dot (pixel) (see Figure 1), which means four pixels are specified by each byte. (For more background see the Color BASIC manual.) Instead of using boolean operators as the Color BASIC manual suggests, four dots could be drawn to graphics memory at a time by converting each set's binary number into decimal and *POKEing* the whole number at once. This is faster than boolean operators and uses much less memory than Extended BASIC's *GET* and *PUT* routines.

The easiest way to produce such a set of numbers is to first draw the image using graph paper as has been done in Figure 1. By using the color key (part a) in the same figure, each dot is then converted to two binary digits. If the dot were to be orange, for example, the two digits would be 1,1. This process continues until the entire object you are interested in is converted to binary digits.

Next, each binary number must be converted to decimal to be *POKEd* in. To convert, use part b of Figure 1. Add the decimal numbers in the diagram which correspond to a one in the binary number you are converting. If a one appears in the leftmost location 128 must be added and so on. Using this, the binary number in row 1 is converted : 00110100 = (128 x 0)+(64 x 0)+(32 x 1)+(16 x 1)+(8 x 0)+(4 x 1)+(2 x 0)+(1 x 0) or 00110100 = 32+16+4 or 00110100 = 52.

Figure 1

The Digitization of Ffloyd

(a)

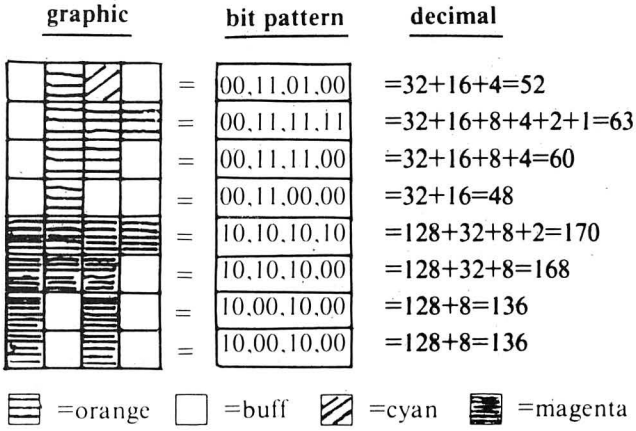
Bits →	7	6	5	4	3	2	1	0
in decimal →	128	64	32	16	8	4	2	1
pixels →	3		2		1		0	

(b)

two bits specify each pixel as follows:

Bit Pair	mode 0	mode 1
0 0	green	buff
0 1	yellow	cyan
1 0	blue	magenta
1 1	red	orange

(c)



Plotting Movements

When using lines 60 and 70, the graphics display begins with location 1024 and every 16 locations—that is, 1040, 1056, and so on—begin a new column. Adding 15 to the base specifies a point on the right side of the screen, adding 8 specifies a point near the center. A graphics worksheet could then be constructed. To plot any point find the byte that holds it by getting the base address at the left and adding the number in the column to it. Use the technique given above to plot a point within a byte. Using this figure it would be possible to draw and animate almost any object or design with only a 4K system.

To move objects on the screen, I recommend that each creature's location be stored in a variable and that this number be the actual memory address of the top byte of the shape. The rest of the bytes in the shape are *POKEd* relative to that reference byte. For example, at the beginning of the game, the array for Ffloyd, our *Glommer* hero, begins in location 1768 so the second byte is then *POKEd* in location 1784, the third in location 1800, the fourth 16 below that and so on. Because of the shape of this array all of the bytes are *POKEd* in one column. That is, the second byte was *POKEd* in the location 16 greater than the reference byte, the third 32 below the reference byte and so on. One byte lower in mode G1C is 16 locations greater as 16 bytes specify a row. In the same way, if the array was wider than one byte the byte to the left of the reference byte would be stored in the address one smaller than the reference, the one to the right would be one greater and so on. Carefully examine how the monsters and Ffloyd are *POKEd* into memory in the program listing if you do not totally understand this idea. Of course, an erase routine must be constructed as well that exactly covers the drawn array.

To move objects to the right in any mode add 1 to their location, to move left subtract 1, to move up subtract the number of bytes that make up one row, in the case of G1C, 16, and add the same amount to move down.

Because this system *POKEs* directly into memory be very careful none of your objects leave the screen. If any do, the system may crash and must be reset or even turned off (thus losing your program) to regain control.

The Game

Ffloyd is trapped in an area with dreaded Glommers. He has only one means of escape, to float the balloons he found in his pocket up to the rainbow barrier at the top and break a hole in it to escape through.

The arrow keys are used to move Ffloyd and the spacebar is used to release balloons. A hole three bricks wide must be

cut to allow Ffloyd to escape. The spacebar will show the scoreboard once Ffloyd has been killed (the action stops) and the up arrow will begin the action. Ffloyd may only be killed by having a Glommer or the wall come near or touch his head.

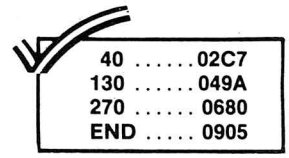
Use the spacebar and then the up arrow to start the game at the beginning. When the last Ffloyd is lost, the colors will reverse. Press the spacebar to see the final score and the up arrow to begin a new game. Glommer objects wrap around, so it is possible to move off one side of the screen and appear on the other.

The game has five levels and gets very difficult as it progresses. The scoring also increases with the bonus for escaping round one at 100 points, round two at 200 and so on. Glommers are worth between two and six points depending upon the round. The wall blocks are always worth one point each.

This game was carefully written and executes about as fast as is possible using *POKEs* and BASIC. Delete the remarks and use the speed-up *POKE (POKE 65495,0)* before running the game for extra speed. If your computer stops on a sound command you cannot use the speed-up *POKE* and must press reset to regain control.

When typing in the program always make a backup copy on tape before testing the program (be sure the computer is in the slow mode before doing this) as this program does *POKE* directly into memory and if you make certain typing errors the computer could lockup and you would lose the copy you have typed unless you saved it to tape.

Glommer is fairly simple but a strangely addictive game; I hope you enjoy it. I have not been able to get through level five—if anyone accomplishes it, please write and tell me how you did it. I would also be interested in comments or applications of these techniques.



The listing:

```
1 REM      TO USE WITH UNEXTENDED
 BASIC ENTER THE FOLLOWING
2 REM      BEFORE THE PROGRAM IS
LOADED:
3 REM      POKE 2048,0 (ENTER)
4 REM      POKE 25,8 (ENTER)
5 REM      NEW (ENTER)
6 REM      CLEAR 8 (ENTER)
7 REM **** GLOMMER
8 REM **** BY DAVID LIONELL DAWS
ON
9 REMARKS SHOULD BE DELETED FOR
USE ON A 4K SYSTEM. (THESE 9 LIN
ES + LINES ENDING WITH A 5.)
10 R=1:B=4:CLS0:PRINT@236,"glomm
er";:PRINT@328,"by";CHR$(128);"d
avid";CHR$(128);"dawson";:DIM A(
5),E(5):A(1)=1172:A(2)=1632:A(3)
=1220:A(4)=1996:A(5)=1940
20 IF PEEK(345)<>247 THEN 20
25 REM SCOREBOARD.
30 CLS0:PRINT@166,"score ";0;:PR
INT@230,"adventurers ";B;:IF B=0
 THEN PRINT@420,"G A M E  O V E
R";:0=0:R=1:B=4
35 REM GO TO ALPHANUMERICS.
40 POKE65472,0:POKE65474,0:POKE6
5476,0:POKE65314,(PEEK(65314)AND
 47)
50 IF PEEK(341)<>247 THEN 50 ELS
E T=P
55 REM SET GRAPHICS MODE.
60 POKE 65473,0:POKE65474,0:POKE
65476,0
65 REM SET START OF GRAPHICS.
70 POKE 65478,0:POKE 65481,0:FOR
 X=65482 TO 65490 STEP 2:POKE X,
0:NEXT
75 REM CHOSE COLOR SET.
80 POKE 65314,136
85 REM CLEAR GRAPHICS SCREEN.
90 FOR X=1024 TO 2048:POKE X,0:N
EXT
95 REM PAINT BARRIER.
100 FOR X=1056 TO 1167:POKEX,245
:NEXT
110 P=1768:N=1775:S=1040:E=5:IF
R>5 THEN R=5
115 REM INITIALIZE FFLOYD, TOP A
ND BOTTOM OF SCREEN, AND CHECK R
OUND.
```


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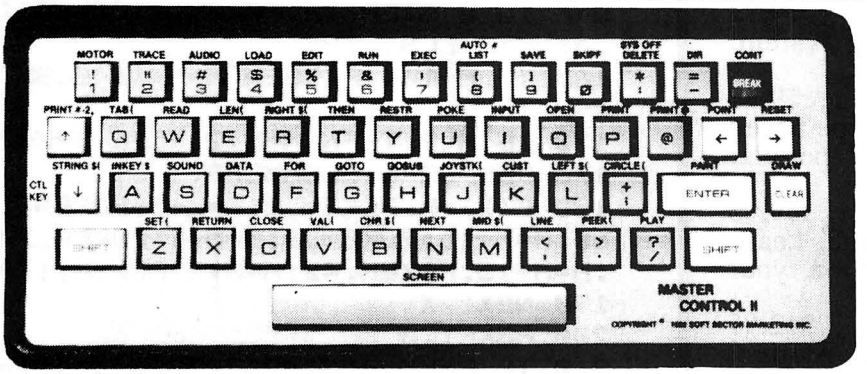
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```
120 FOR X=1 TO R:E(X)=A(X):NEXT:
J=1
130 GOTO 340
135 REM MONSTER MOVEMENT.
140 FOR X=1 TO R:M=E(X)
150 IF RND(4)=1 THEN E=M+32:FOR
Q=M TO E STEP 16:POKEQ,0:POKEQ+1
,0:NEXT ELSE 190
160 IF M-16< P THEN M=M+16 ELSE
M=M-16
170 IF M<P THEN M=M+2 ELSE M=M-2
175 REM DRAW GLOMMERS.
180 E(X)=M:POKEM,2:M=M+1:POKEM,1
60:M=M+15:POKEM,8:M=M+1:POKEM,72
:M=M+15:POKEM,42:M=M+1:POKEM,170
190 NEXT X
200 POKET,0
210 IF PEEK(345)=247 THEN I=1:T=
P+1
220 IF I<>1 THEN 300
225 REM MOVE SHOTS.
230 T=T-32
240 IF T<S THEN I=0:GOTO 300
250 POKET,60:K=PEEK(T-16):IF K=0
 THEN 300
260 I=0:POKET-16,0:FOR L=1 TO R:
IF T-16<E(L) THEN 290
270 X=E(L)+48:IF X<T-16 THEN 290
280 SOUND255,10:FOR Z=E(L) TO X:
POKE Z,255:POKE Z,0:NEXT:E(L)=A(
L):O=O+R
290 NEXT L:SOUND1,1:O=O+1
295 REM CHECK KEYBOARD.
300 IF PEEK(341)=247 THEN NP=P-1
6 ELSE IF PEEK(342)=247 THEN NP=
P+16 ELSE IF PEEK(343)=247 THEN
NP=P-1 ELSE IF PEEK(344)=247 THE
N NP=P+1 ELSE 350
310 IF NP>N THEN NP=N:GOTO330 EL
SE IF S<P THEN 330
315 REM END OF ROUND.
320 FOR X=1 TO 9:SOUNDX*20,1:POK
E65314,128:POKE65314,136:NEXT:O=
O+R*100:R=R+1:GOTO20
325 REM ERASE FFLOYD
330 FOR X=P TO P+112 STEP16:POKE
X,0:NEXT:P=NP
335 REM DRAW FFLOYD
340 POKE P,52:POKEP+16,63:POKEP+
32,60:POKEP+48,48:POKEP+64,170:P
OKEP+80,168:POKEP+96,136:IF RND(
2)=1 THEN POKEP+112,136 ELSE POK
EP+112,130
345 REM IS FFLOYD HIT?
350 IF PEEK(P-16)<>0 OR PEEK(P+3
1)<>0 OR PEEK(P+33)<>0THEN B=B-1
:IF B=0 THEN POKE 65314,128:GOTO
20 ELSE SOUND100,5:SOUND5,10:GOT
020
360 GOTO 140
```

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STAR — KITS

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STAR-KIBBITS

Welcome to the ninth of my monthly chats. To begin with, a short program and two requests.

When you do a BACKUP on a disk system, the computer is supposed to make an exact copy of a disk. Have you ever wondered whether the copy is really identical to the original? Here is a short program in Basic which allows you to compare two disks (it is written for two drives):

```
10 CLEAR 2000
20 FOR T=O TO 34 : FOR S=1 TO 18
30 DSKI$ O,T,S,A$,B$
40 DSKI$ 1,T,S,C$,D$
50 If A$=C$ AND B$=D$ THEN 70
60 PRINT "DIFFERENCE ON";T;S
70 NEXT S : NEXT T
```

This program consists of two loops which repeat for tracks 0 through 34, and sectors 1 through 18 of each track. Lines 30 and 40 read the corresponding sectors from drives 0 and 1, and line 60 prints the track and sector number for those sectors which are different on the two disks. You may find it very useful.

OK, now here's the first request. I'd like you to help me with a simple test. Initialize two disks with the DSKINI command, and then BACKUP one of them to the other. Now use the above program to check whether they are really identical, and let me know. I have an ulterior motive — I have run this test on three different computers (including different disk controllers and different drives). On two of them I got identical errors on sector 13 of tracks 5, 11, 17, 23, and 29. I'm curious to see whether anyone else has the same problem.

TAX DEDUCTION?

Now for the second request. Do you have any Color Computer hardware or software which you would like to donate to a non-profit school? In the last few years, Star-Kits has donated six Color Computers, as well as several printers, disk drives and cassette recorders, to local schools for computer education. If you have any CoCo equipment or software (such as a color computer, or disk system, or Line Printer VII, or anything else which you no longer need), or else if you just feel up to making a tax-deductible contribution of equipment or cash, we'd like to encourage you to do so. Send to the St. Francis School, 12 Green Street, Mt. Kisco NY 10549.

SALE!

Christmas is slowly approaching, and with it the time for the traditional holiday sales. The following items will be offered at special sale prices until December 24th, 1983:

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HUMBUG-64, the 64K version for Flex or STAR-DOS is reduced from $59.95 to $49.95.

Add this to the rebate we announced last month, and you can get Star-Kits software at really bargain prices.

To close, a neat definition (from *The Devil's DP Dictionary* by Stan Kelly-Bootle) of Gershwin's Law: "It ain't necessarily so!"

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By Tony DiStefano
Rainbow Contributing Editor

Trying to come up with one project a month is sometimes just too much. First, I must think of a good project, then, there is the research. Making diagrams and designing circuits. After that, there is the proto-typing, (that is the hardest part and the most time consuming)—buying the parts, soldering it together, and then trying to find out why it doesn't work. Sometimes that requires a whole change of circuit. After the hardware works fine, it's time to write the article. All this must be leading up to something; it is, this month is cleanup month. It's time to answer a few questions and clear up a few problems. That is to say I didn't have time to complete a project. But, I'll tell you this, there will be some *hot* projects coming this fall.

Okay, the first thing on the agenda is a correction: Radio Shack does have a 1 mega-ohm potentiometer. The part number is 271-211. This correction comes from the April 1983 issue of *the Rainbow*. It stated that Radio Shack did not carry this part, but as someone pointed out to me, they do. This was in my finger-saving rapid-fire project.

The next thing is a little longer. A reader sent me a letter and asked me if it was possible to do my Reverse Screen on a "F" board, or the latest version, the one which has the smaller RF shield. Well, it is possible to do it. There are just a few differences. The first change is the "U," or chip numbers. Since Radio Shack decided to change the complete layout of the Color Computer, they changed the chip ID numbers. U29 on the old board now becomes U8 on the new board, that's the 74LS02. U7 on the old board becomes U6 on the new board, that's the MC6847. I stated in my article you have to remove the 74LS02 and bend the pins upwards and replace the chip in the socket with the pins sticking out. Well you can't do that on the new board. Radio Shack decided to save a few cents by not putting this chip in a socket. Fortunately they had the insight not to solder the input pins to ground. When making the modification you don't have to remove the chip, just solder your wire straight to the pin, there is nothing connected on the other side. Use the same pin numbers as the other chip. Remember though, you still have to bend pin number 32 on the MC6847. Apart from these changes, the reverse screen will work fine.

The next problem is with my Y'er. You cannot plug in a Radio Shack program pack or any other pack for that matter, into one of the slots when the disk controller is plugged in the other slot. It will not work and might even cause damage to the computer and or to the disk controller. This is because the bus is not buffered nor does it have the switches to select between different slots. It will only work with my projects or other projects that are independently memory mapped. That is to say it does not use the CTS (pin number 32 on the cartridge connector) or SCS (pin number 32 on the cartridge connector) for selecting the device. These signals are being used by the disk controller software and hardware. If another device were to use these signals, there would be a bus contention and the CPU would get very confused. Maybe later on I could work on an adapter that would let you use these signals without any problems.

Another point of interest to you goes back to my article on memory chips. If you can recall, I talked about ROMS and EPROMS. Here is a little more. The socket that is available for Extended BASIC inside your computer has 24 pins. It usually holds an 8K ROM supplied by Radio Shack. This is where Extended *BASIC* resides. It is necessary though, to put an Extended *BASIC* ROM there. You can put different software there. All you need is to insert a chip. What chip? That depends on how long your program is. It is possible to put software that takes from 1K to 8K of memory. Most of the time an average user puts in an EPROM, because they are so easy to program, and are relatively inexpensive. All you need is some software and an EPROM Programmer, and of course an EPROM. Most of the common EPROM chips available today are 24 pins, that means that they are pin compatible with the socket (in the Color Computer) and will plug into the socket directly. There is however, one chip that is not. This is the 2764 8K EPROM. They why use it? You might ask. Well it's the least expensive 8K EPROM chip on

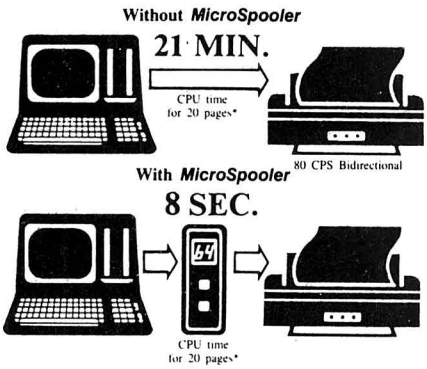
This adaptation works for the 2764 EPROM only. After the adaptation, it will fit in any of the Color Computer's ROM sockets: BASIC, Extended BASIC, or even the Disk BASIC socket.

(Tony DiStefano is well known as an early specialist in Color Computer hardware projects. He is one of the acknowledged experts on the "insides" of CoCo.)

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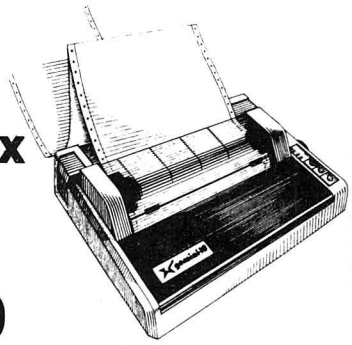
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This adaptation can be done directly to the chip or in-between two extra sockets. If done with the sockets, one 24 and one 28-pin socket is needed. The 28-pin to seat the EPROM and the 24 to go into the other socket.

1) Directly on the Chip.
   a) Solder pins 1, 28, 27 and 26 together.
   b) Pry up pin 20 so that it does not go back in the socket when the chip is replaced.
   c) Solder pins 20 and 22 together
   d) Solder a wire to pin 2 and insert the other side of the wire into the hold left by pin 20.
   e) Insert the chip so that pin 3 on the chip goes into pin 1 in the socket.
2) Using two sockets.
   a) Align pin 3 of the 28 pin socket on top of pin 1 of the 24 pin.
   b) Solder all the pins but pin 20 of the 28 pin socket to the 24 pin socket.
   c) Solder pins 1, 28, 27, 26 of the 28 pin together.
   d) Solder pin 20 to pin 22 on the 28 pin socket.
   e) Insert chip into the top socket. Pin 1 of the chip goes into pin 1 of the socket.
   f) Insert the bottom socket into computer socket. Pin 1 goes into pin 1 on both sockets.

The only other consideration left is when programming the 2764. The above modification reverses the address lines A11 and A12 as seen by the Color Computer. This means that, at programming time, these lines must be again reversed. This can be done in software or in hardware. Hardware requires that the two traces that lead to the EPROM programmer socket be reversed. In software all you have to do is transfer the second 2K block of memory with the third 2K block of memory.

Some of you who have had problems with my projects have written me asking for help. I must confess. I have a hard time answering letters. If you do write me, be patient, I *will* answer in time. Tell you what, I'll set aside one night a week, let's say Monday night, when you can call me at home, and talk to me about your problems. My telephone number is (514) 473-4910. But please, don't call before 7 p.m. or after 11 p.m. The cost of your long distance call might be worth not having to wait for a response in a letter.

Hint . . .

Single Disk *COPY*

Here's a feature which can be invaluable for users with a single disk drive. The Radio Shack Disk Manual mentions that use of the *COPY* Command requires two or more drives. This is not necessarily true. A single drive *COPY* can be made by doing the following:

1) Insert disk with file to be copied into the drive 0.
2) Type "COPY "FILENAME/ext:0" and press <ENTER>.
3) There will be one short beep and a notice will appear on the screen instructing the user to insert the destination disk.
4) Insert destination disk and press <ENTER>.
5) Once completed there will be two copies of the program: one original and one on the destination disk.

This method works for all types of disk files including machine language programs. It surprises me that Radio Shack would not mention such an important feature in their documentation.

—Larry Sandhaas

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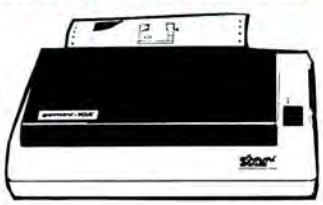
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By Joseph Kohn



If you enjoyed my version of *Color Poker*, which appeared in the April 1983 issue, you will find this version of Blackjack to be a pleasant companion. The game is played with you against the dealer. As explained later on, betting is done for you on a random basis, which speeds playing and adds an additional chance factor.

The dealer has two decks of cards and will reshuffle before the start of a new deal if there are less than 20 cards remaining. This allows you to do card counting to improve your luck. You have the option of splitting opening pairs. If you do split, your bet is doubled and split between the two hands.

In terms of win/lose, if you "bust," it's all over. If you make a "Blackjack," you win and the hand ends. You will break even in a tie with the dealer, including a "21."

Now, on with the program. The listing contains comments and should be straightforward to follow. All the subroutines are placed at the end of the program, starting at line 1470.

Lines 120—610 contain the strings used to *DRAW* the required ASCII characters on the *PMODE1* screen. Subroutine 1480 does the actual drawing. The screen is blanked while the card symbols and the opening title are created; also the two decks of cards are formed in lines 650—690.

The cards are created by three variables: CV(), CN(), and CS() for card value, card number and card suit. The card value is first set to the number of the card (1 to 13) then changed to 10 for jacks, queens and kings or to 11 for aces. The ace is counted high, as 11, unless the total value of a hand is over 21, then the aces revert to a value of 1.

The player's bet is selected in line 900 in increments of $100. The initial deal is started in line 940. The two-dimensional variable CD() keeps track of the dealer's cards as well as the player's cards, including splits. The player's cards are checked to see if there is a pair by line 980. If there is, the player is given the option to split.

Line 1020 checks for player Blackjack. The variable PT() is the tally of the players' hands, which are obtained from subroutine 1770.

If the split option is taken, the program branches to deal the split

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in line 1150. Both hands are checked for Blackjacks or "21," then back to play hand 1 (line 1010).

The player must respond to the HIT? question with either (Y) or (N). If another card is drawn the tally is checked to see if it is over 21 (bust). If not, the sequence is repeated.

When the player stops drawing cards, play passes to the dealer in line 1210. The dealer will draw until the card tally is over 17.

Once all the cards are down, the scoring routine is called, line 1280. All hands win/lose even money except Blackjack, which pays 3 to 2. Woe unto the loser of more than $3000. A special treat awaits him courtesy of Morton Goldberg (February 1983 *Rainbow*)

Key Variables:

A$()	Strings to draw ASCII characters
CN()	Card number (1 to 13)
CV()	Card value (1 to 11)
CS()	Card suit (1 to 4)
DD()	Array of cards dealt (1 to 104)
BT	Bet ($100 to $1000)
CD(H,X)	Cards in each hand
SP	SP=1 for split
PT()	Tally of players' hands
CT	Tally of dealer's hand
TT	Money player has
DK	Number of cards left to deal

(Joseph Kohn, a systems engineer for TRW, is interested in games and utilities. His current activities include a user's group at Norton AFB and formation of an Inland Empire user's group.)

170	01E1	1200	129D
350	0465	1370	1510
520	06F2	1410	16F6
650	094F	1500	197C
790	0BBD	1670	1BD4
1060	106D	END	1E03

The listing:

```
10 GOTO30000
20 '20FEB83
30 '**********************
40 '* COLOR BLACKJACK *
50 '*   VERSION 1.0   *
60 '*   JOSEPH KOHN   *
70 '*1343  BLOSSOM AVE*
80 '*REDLANDS,CA 92373*
90 '**********************
100 CLS:DIM A$(89):X=RND(-TIMER)
110 '---DRAW STRINGS
120 A$(33)="U4E2F2D2NL4D2BR3" 'A
130 A$(34)="RU6LR3FDGNL2FDGL3BR7
 'B
140 A$(35)="BR3E1BU4H1L2G1D4F1R2
BR4"'C
150 A$(37)="R4BU6L4D3NR2D3BR7" '
E
160 A$(38)="U6NR4D3NR2D3BR7" 'F
170 A$(39)="BR4BU5H1L2G1D4F1R3U2
NL1D2BR3" 'G
180 A$(40)="U6D3R4U3D6BR3" 'H
190 A$(41)="BU6BR1R2L1D6L1R2BR4"
 'I
200 A$(42)="BU1F1R2E1U5BD6BR3"
'J
210 A$(43)="U6D3R1NE3F3BR3" 'K
220 A$(44)="NU6R4BR3" 'L
230 A$(46)="U6F4U4D6BR3" 'N
240 A$(47)="BU1U4E1R2F1D4G1L2NH1
BR6" 'O
250 A$(48)="U6R3F1D1G1L3BF3BR4"
'P
260 A$(49)="BUU4ER2FD3GNHNFGLNHB
R6" 'Q
270 A$(50)="U6R3F1D1G1L3R1F3BR3"
 'R
280 A$(51)="R3E1U1H1L2H1U1E1R3BD
6BR3" 'S
290 A$(52)="BU6R4L2D6BR5" 'T
300 A$(53)="BU1U5BR4D5G1L2NH1BR6
" 'U
310 A$(54)="BU4NU2FDFNDEUEU2BD6B
R3" 'V
320 A$(55)="NU6E2F2NU6BR3" 'W
330 A$(57)="BU6D1F2E2U1D1G2D3BR5
" 'Y
340 A$(65)="BU4R2F1D1L2G1F1R2NU2
R1BR3" 'a
350 A$(66)="U6D2R3F1D2G1L3BR7" '
b
360 A$(69)="BR3L2H1U2E1R2F1D1NL4
BD2BR3" 'e
370 A$(72)="U6D3E1R2F1D3BR3" 'h
380 A$(73)="BU6BR1R1BD2NL1D4L1R2
BR4" 'i
390 A$(79)="BU1U2E1R2F1D2G1L2NH1
BR7" 'o
400 A$(82)="U4D1E1R2F1BD3BR3" 'r
410 A$(83)="R3E1H1L2H1E1R3BD4BR3
" 's
420 A$(84)="BU5R4L2U1D5F1E1BD1BR
3" 't
430 A$(85)="BU4D3F1R2NU4R1BR3" '
u
440 A$(86)="BU4F1D1F1ND1E1U1E1BD
4BR3" 'v
450 A$(87)="BU4D3F1E1NU2F1E1U3BD
4BR3" 'w
460 A$(0)="BR3"'SPACE
470 A$(1)="BR1R1BU2U4BD6BR5" '!
480 A$(4)="BR2U6D1R2L3G1F1R2F1G1
L3BD1BR7" '$
490 A$(10)="BUE4BD4H4BR2D4BH2R4B
D3BR3" '*
500 A$(16)="BU1U4E1R1F1D4G1L1NH1
BR6" '0
510 A$(17)="BU6BR2NG1D6L1R2BR4"
'1
520 A$(18)="BU5E1R2F1D1G1L2G1D2R
```

```
4BR3" '2
530 A$(19)="BU5ER2FD0NLFD0L2NHBR
6" '3
540 A$(20)="BU2U1E3D4NR1NL3D2BR4
" '4
550 A$(21)="BU1F1R2E1U2H1L3U2R4B
D6BR3" '5
560 A$(22)="BU6BR3L1G2D3F1R2E1U1
H1L3BD3BR7" '6
570 A$(23)="BU6R4D1G4D1BR7" '7
580 A$(24)="BUUER2EUHL2GDFR2FD0L
2NHBR6" '8
590 A$(25)="BRRE2U3HL2GDFR3BD3BR
3" '9
600 A$(26)="BU6NG1D6L1R2BR2BU1U4
E1F1D4G1NH1"   '10
610 A$(31)="BR1R1BU2E2U1H1L2G" '
?
620 '---TITLE
630 PMODE1,1:PCLS2:DRAW"BM62,52;
S16C1":X$="COLOR":GOSUB1490:DRAW
"BM66,52;C3":GOSUB1490:DRAW"BM6,
112;C1":X$="BLACKJACK":GOSUB1490
:DRAW"BM10,112;C3":GOSUB1490
640 '---CREATE DECK
650 Z=0:DIMCN(104),CD(2,9),CS(10
4),CV(104),DD(104),C(12),H(12),S
(12),D(12)
660 FORI=0TO1:FORX=1TO4 '1=CLUB,
2=SPADE,3=HEART,4=DIAMOND
670 FORY=1TO13:Z=Z+1:CS(Z)=X:CV(
Z)=Y:CN(Z)=Y
```


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RAINBOW


```
680 IF CN(Z)=1THEN CV(Z)=11 'ACE

690 IF CN(Z)>10THEN CV(Z)=10 'JA
CK,QUEEN,KING
700 NEXTY,X,I
710 '---CREATE SYMBOLS
720 DRAW"BM68,156;S8C3RURDR2U2LU
RUR3DRDLD2R2URDRD3LDLUL3D2LU2L3D
LULU3"
730 PAINT(80,152),3,3:GET(68,148
)-(91,167),C,G
740 DRAW"BM100,156;C4BRRURURURUD
RDRDRDRDLDLDLDLDULULULULU"
750 PAINT(114,156),4,4:GET(100,1
48)-(123,167),D,G
760 DRAW"BM132,156;C3BRRURURURUR
DRDRDRDRD2LDLUL2D3LU3L2DLULU2"
770 PAINT(146,156),3,3:GET(132,1
48)-(155,167),S,G
780 DRAW"BM164,156;C4BRU2RURUDRD
R3URUDRDRD2LD2LDLDLDLULULULU2L"
790 PAINT(170,152),4,4:GET(164,1
48)-(187,167),H,G
800 SCREEN1,0:FORX=1TO1000:NEXT:
PLAY"V20T15L104CL203GP5GL1AGP1BO
4C"
810 '---RULES DISPLAY
820 CLS0:PRINTSTRING$(8,"*")"C0C
0 CASINO RULES"STRING$(7,"*")"
830 PRINT"DEALER:":PRINT"  STAND
S ON 17 OR MORE.":PRINT"  DRAWS
ON 16 OR LESS.":PRINT"  HAS 2 DE
CKS.":PRINT"  SHUFFLES WITH 20 C
ARDS LEFT.":PRINT:PRINT
840 PRINT"PLAYER:":PRINT"  MAY S
PLIT PAIRS.":PRINT"  STARTS WITH
 $1000."
850 TT=1000:PRINT@480,"READY?";
860 GOSUB 1660:CLS
870 '---START PLAY
880 GOSUB1670
890 COLOR4,1:PCLS:IFDK<21GOSUB16
70
900 BT=100*RND(10):BT$=MID$(STR$
(BT),2):DRAW"BM20,102;C4":X$="Yo
ur bet is $"+BT$+"!":GOSUB1490
910 SCREEN1,0
920 FORX=0TO9:FOR H=0TO2:CD(H,X)
=0:NEXT H,X  'H=0 DEALER, H=0/1
PLAYER
930 '---INITIAL SET UP
940 GOSUB1500:CD(0,0)=Z  'DEALER
 SHOW CARD
950 XX=0:YY=0:GOSUB1520
960 COLOR3,1:LINE(16,0)-(42,66),
PSET,BF:CIRCLE(30,32),10,1,2
970 K=1:FORX=0TO1:GOSUB1500:CD(1
,X)=Z:XX=16*X:YY=106:GOSUB1520:N
EXT
980 IFCN(CD(1,0))=CN(CD(1,1))THE
```

```
NDRAW"BM2,188C2":X$="SPLIT?":SP=
1:GOSUB1490ELSESP=0:GOTO1010
990 GOSUB1660:GOSUB1830
1000 IFK$="N"THENSP=0:GOTO1010EL
SE1150
1010 '---PLAYER HAND 1
1020 H=1:GOSUB1770:PT(1)=T:IFPT(
1)=21THENPT(1)=99:DRAW"BM2,188":
X$="BLACKJACK":GOSUB1490:GOTO107
0
1030 DRAW"BM2,188":X$="HIT?":GOS
UB1490:GOSUB1660:GOSUB1830:IFK$=
"N"THEN1070
1040 GOSUB1500:K=K+1:CD(1,K)=Z:X
X=16*K:YY=106:GOSUB1520
1050 H=1:GOSUB1770:DRAW"BM2,188"
:PT(1)=T:IF T>21THENX$="BUST!":G
OSUB1490:GOTO1070
1060 IFPT(1)=21THENX$="*21*":GOS
UB1490:GOTO1070ELSE1030
1070 IFSP=0THEN1210
1080 '---PLAYER HAND 2
1090 IFPT(2)=99THEN1210
1100 K=1
1110 DRAW"BM128,188":X$="HIT?":G
OSUB1490:GOSUB1660:GOSUB1840:IFK
$<>"N"THEN1120ELSEH=2:GOSUB1770:
PT(2)=T:GOTO1210
1120 GOSUB1500:K=K+1:CD(2,K)=Z:X
X=128+K*16:YY=106:GOSUB1520
1130 H=2:GOSUB1770:DRAW"BM128,18
8":PT(2)=T:IF T>21THENX$="BUST!"
:GOSUB1490:GOTO1210
1140 IFPT(2)=21THENX$="*21*":GOS
UB1490:GOTO1210ELSE1110
1150 '---REDEAL FOR SPLIT
1160 CD(2,0)=CD(1,1):GOSUB1500:C
D(1,1)=Z:XX=16:YY=106:GOSUB1520
1170 GOSUB1500:CD(2,1)=Z:FORI=0T
01:Z=CD(2,I):XX=126+16*I:YY=106:
GOSUB1520:NEXT
1180 H=2:GOSUB1770:PT(2)=T
1190 IFPT(2)=21THENPT(2)=99:DRAW
"BM128,188":X$="BLACKJACK":GOSUB
1490
1200 GOTO1020
1210 '---COMPLETE DEALER HAND
1220 K=0:IFPT(1)>21THENIFSP=0THE
N1290ELSEIFPT(1)>21ANDPT(2)>21TH
EN1290
1230 K=K+1:GOSUB1500:CD(0,K)=Z:X
X=16*K:YY=0:GOSUB1520
1240 H=0:GOSUB1770:CT=T:IF CT<17
THEN1230ELSEIFCT<21THEN1290
1250 DRAW"BM128,50":X$="BUST!"
1260 IFCT=21THENX$="*21*":IFK=1T
HENX$="BLACKJACK"
1270 GOSUB1490
1280 '---SCORING
1290 LINE(0,68)-(255,102),PRESET
,BF:LO=0
1300 H=1:GOSUB1700
1310 IFSP=1THENH=2:GOSUB1700
1320 DRAW"BM20,86":IFLO=0THENX$=
"BROKE EVEN!":GOTO1350
1330 IFLO>0THENX$="You LOST $"EL
SEX$="You WON $"
1340 X$=X$+MID$(STR$(LO),2)+"!"
1350 GOSUB1490:TT=TT-LO:IFLO<0TH
ENPLAY"T203L16CEGL804CL1603GL404
C"ELSEIFLO>0THENSOUND50,10ELSESO
UND100,2:SOUND50,2
1360 IFTT<0THENX$="You owe $"ELS
EX$="You have $"
1370 DRAW"BM30,102":X$=X$+MID$(S
TR$(TT),2)+"!":GOSUB1490
1380 GOSUB1660:IFTT>-3001GOTO890
ELSECLS:PRINT@108,"SORRY!":PRINT
@257,"YOU EXCEEDED YOUR $3000 LI
MIT!":SCREEN0,1:FORX=1TO10:SOUND
200-15*X,9:NEXT
1390 CLS8:FORH=0TO63:SET(H,0,3):
NEXT:FORV=0TO31:SET(63,V,3):NEXT
:FORH=63TO0STEP-1:SET(H,31,3):NE
XT:FORV=31TO0STEP-1:SET(0,V,3):N
EXT:FORH=3TO60:SET(H,2,1):NEXT:F
ORV=3TO29:SET(60,V,1):NEXT:FORH=
60TO3STEP-1:SET(H,29,1):NEXT
1400 FORV=29TO3STEP-1:SET(3,V,1)
```


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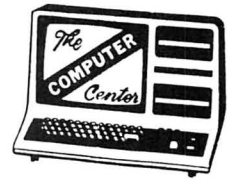
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```
:NEXT:FORH=7TO56STEP2:RESET(H,6)
:NEXT:FORV=8TO24STEP2:RESET(57,V
):NEXT:FORH=56TO6STEP-2:RESET(H,
26):NEXT:FORV=24TO7STEP-2:RESET(
6,V):NEXT
1410 FORH=9TO13:RESET(H,12):NEXT
:FORV=13TO18:RESET(11,V):NEXT:FO
RH=17TO20:RESET(H,15):NEXT:FORV=
12TO18:RESET(16,V):NEXT:FORV=12T
018:RESET(21,V):NEXT:FORH=25TO27
:RESET(H,12):NEXT
1420 FORH=25TO27:RESET(H,15):NEX
T:FORH=25TO27:RESET(H,18):NEXT:F
ORV=12TO18:RESET(24,V):NEXT:FORH
=34TO37:RESET(H,12):NEXT:FORH=34
TO37:RESET(H,15):NEXT:FORH=34TO3
7:RESET(H,18):NEXT:FORV=12TO18:R
ESET(34,V):NEXT
1430 FORV=12TO18:RESET(40,V):NEX
T:FORV=12TO18:RESET(46,V):NEXT:R
ESET(41,12):RESET(41,13):RESET(4
2,14):RESET(43,15):RESET(44,16):
RESET(45,17):RESET(45,18):FORH=4
9TO54:RESET(H,12):NEXT:FORH=49TO
54:RESET(H,18):NEXT
1440 FORV=13TO17:RESET(50,V):NEX
T:FORV=13TO17:RESET(54,V):NEXT
1450 FORX=1TO5:FORH=5TO56STEP2:S
ET(2+H,6,8):NEXT:FORH=5TO56STEP2
:RESET(2+H,6):NEXT:FORV=6TO25STE
P2:SET(57,V+2,8):NEXT:FORV=6TO23
STEP2:RESET(57,2+V):NEXT:FORH=56
TO6STEP-2:SET(2+H,26,8):NEXT
1460 FORH=54TO5STEP-2:RESET(2+H,
26):NEXT:FORV=24TO6STEP-2:SET(6,
2+V,8):NEXT:FORV=24TO6STEP-2:RES
ET(6,2+V):NEXT:NEXTX:GOTO820
1470 '***SUBROUTINES***
1480 '---DRAW ASCII
1490 FORX1=1TO LEN(X$):Y1=ASC(MI
D$(X$,X1,1))-32:DRAWA$(Y1):NEXT:
DRAW"C4":RETURN
1500 '---DEAL
1510 Z=RND(104):IFDD(Z)=1THEN151
0ELSEDD(Z)=1:DK=DK-1:RETURN
1520 '---CARD GRAPHICS
1530 COLOR2,1:LINE(XX,YY)-(XX,YY
+66),PRESET:LINE(XX+2,YY)-(XX+30
,YY+66),PSET,BF
1540 CC$="4":IF CS(Z)<3THEN CC$=
"3"
1550 X$=CHR$(CN(Z)+48)
1560 IFCN(Z)=1THENX$="A"
1570 IF CN(Z)>10THEN X$=MID$("JQ
K",CN(Z)-10,1)
1580 DRAW"BM"+STR$(XX+4)+","+STR
$(YY+16)+"S8C"+CC$:GOSUB1490
1590 DRAW"BM"+STR$(XX+18)+","+ST
R$(YY+62):GOSUB1490
1600 ON CS(Z) GOTO 1610,1620,163
0,1640
1610 PUT(XX+4,YY+24)-(XX+27,YY+4
3),C,PSET:RETURN
1620 PUT(XX+4,YY+24)-(XX+27,YY+4
3),S,PSET:RETURN
1630 PUT(XX+4,YY+24)-(XX+27,YY+4
3),H,PSET:RETURN
1640 PUT(XX+4,YY+24)-(XX+27,YY+4
3),D,PSET:RETURN
1650 '---GETKEY
1660 K$=INKEY$:I=INSTR(1," NY"+C
HR$(13),K$):IFI<2THEN1660ELSERET
URN
1670 '---SHUFFLE
1680 FORI=1TO104:DD(I)=0:NEXT:DK
=105
1690 DRAW"BM64,86C2":X$="SHUFFLE
!":GOSUB1490:RETURN
1700 '---WIN/LOSE
1710 IFPT(H)=99THENLO=LO-BT*1.5:
RETURN
1720 IFPT(H)>21THENLO=LO+BT:RETU
RN
1730 IFPT(H)>CT THENLO=LO-BT:RET
URN
1740 IFPT(H)<CT THENIFCT>21THENL
O=LO-BT ELSELO=LO+BT
1750 RETURN
1760 '---TALLY CARDS
1770 T=0:A=0:FORX=0 TO K 'A=NUMB
ER OF ACES
1780 IFCN(CD(H,X))=1THENA=A+1
1790 T=T+CV(CD(H,X)):NEXT
1800 IFT>21THENT=T-10*A
1810 RETURN
1820 '---ERASE BLOCKS
1830 LINE(0,174)-(80,188),PRESET
,BF:RETURN
1840 LINE(128,174)-(208,188),PRE
SET,BF:RETURN
10000 FORX=1TO2:PRINTX:MOTORON:F
ORY=1TO6000:NEXT:CSAVE"BLACKJAC"
:NEXT:END
20000 PRINT#-2,CHR$(17)CHR$(30)C
HR$(31)CHR$(27)"B""***COLOR BLAC
KJACK***"CHR$(30):LLIST:END
30000 PCLEAR2:GOTO20
```


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FEATURES

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*** USER FRIENDLY AND FULLY MENU DRIVEN ***
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FEATURES

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*** MENU PROMPTS MAKE ENTRIES EASY, FAST, AND EFFICIENT ***

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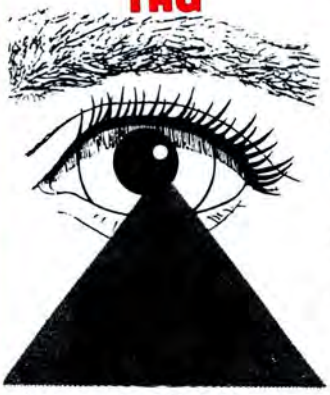
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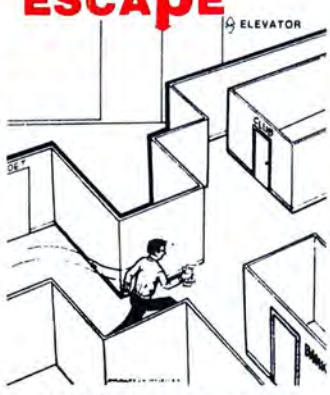
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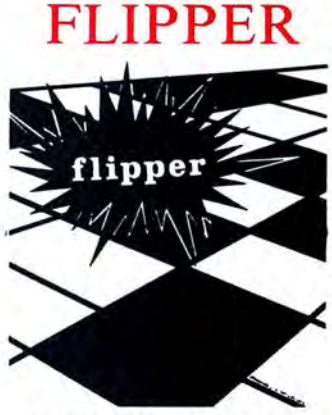
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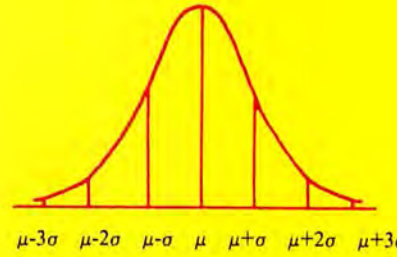
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Statistics in the Classroom: Mean and Standard Deviation

By Stan Peppenhorst



μ = mu = (arithmetic average)
σ = sigma = standard deviation

In a normal distribution, 68.26% will be within one standard deviation of the mean (-1 to +1), 95.44% will fall within two standard deviations of the mean, and 99.75% will fall within three standard deviations.

Teachers often need the arithmetic average (mean) and standard deviation of a set of test scores. This program calculates the mean, and displays two standard deviations on each side of the mean. (In this program, standard deviation is calculated as the square root of the variance.) The program can be adapted for use by those not in education by substituting other words to describe the data gathered.

The number of items is requested in line 130 and is limited to 50 by line 120. Line 150 requests the student's name or initials followed by a comma and the score. The name can be omitted by starting with the comma. This permits flexibility by using only numbers.

Insert "I;" after the second *PRINT* in line 180 if numbering is desired. If a student number is preferred, change N$ to N in lines 120, 150, and 180. The format of the printed data can be changed by using the comma, the semicolon, or nothing after N$(I) and S(I) in line 180. Line 180 also has a timer loop.

Lines 1025 and 1055 round the values to the nearest hundredth. These lines may be omitted or the precision may be altered by changing the exponents. In addition, calculations for -3 to +3 standard deviations may be added to lines 1070 and 1090 if desired.

(Stan Peppenhorst teaches high school physics and is a doctoral candidate in educational administration and supervision at Memphis State University.)

160.... 01C7
END... 046C

```
10 ' MEAN AND STANDARD DEVIATION
20 '
30 ' BY STAN PEPPENHORST
40 '    GERMANTOWN HS
50 '    GERMANTOWN, TN 38138
60 '
70 CLS:PRINT
80 PRINT "    STUDENT SCORES, TH
E MEAN,"
90 PRINT "    AND STANDARD DEVIA
TION"
100 PRINT:PRINT
110 REM  MAXIMUM CLASS SIZE=50
120 DIM N$(50),S(50)
130 PRINT "HOW MANY STUDENTS TOO
K THE EXAM";:INPUT C:PRINT
140 PRINT "ENTER THE NAME OR INI
TIALS FOR  EACH STUDENT FOLLOWED
 BY A COMMA AND THE EXAM SCORE."
150 PRINT:FOR I=1 TO C:INPUT N$(
I),S(I):NEXT I
160 GOSUB 1000
170 PRINT "WOULD YOU LIKE THE NA
MES AND    SCORES PRINTED?  (Y O
```

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DEALER INQUIRES INVITED


```
R N)":INPUT A$:IF A$="Y" THEN 18
Ø ELSE 2ØØØ
18Ø PRINT:FOR I=1 TO C:PRINT N$(
I);S(I),:NEXT I:FOR X=1 TO 1ØØØØ
:NEXT X:GOTO 2ØØØ
2ØØ STOP
1ØØØ '  SUBROUTINE FOR MEAN AND
        STANDARD DEVIATION
1Ø1Ø REM  COMPUTE AND PRINT MEAN
1Ø2Ø PRINT:FOR I=1 TO C:T=T+S(I)
:NEXT I:PRINT:PRINT:A=T/C
1Ø25 A=INT(A*1Ø^2+.5)/1Ø^2
1Ø3Ø PRINT "THE CLASS AVERAGE IS
";A;".":PRINT
1Ø4Ø REM  COMPUTE AND PRINT THE
STANDARD DEVIATIONS
1Ø5Ø FOR I=1 TO C:S=S(I)^2:S1=S1
+S:NEXT I:D=SQR(S1/C-A^2)
1Ø55 D=INT(D*1Ø^2+.5)/1Ø^2
1Ø6Ø PRINT "THE STANDARD DEVIATI
ON IS";D;"."
1Ø7Ø P1=A+D:P2=A+2*D:M1=A-D:M2=A
-2*D:PRINT
1Ø8Ø PRINT "    THE VALUES FOR T
HE STANDARD DEVIATIONS ARE:"
1Ø9Ø PRINT "  +2",P2,"  +1",P1,"
  MEAN",A,"  -1",M1,"  -2",M2
11ØØ RETURN
2ØØØ END
```

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Back copies of many issues of *the RAINBOW* are still available.

All back issues sell for the single issue cover price—which is $2 for copies of Volume I, Numbers 1-8 (through February, 1982), $2.50 for Volume I, Numbers 9, 10 and 12 (through June except May, 1982) and $2.95 for Volume II, Numbers 9, 10, 11, 12 (March, April, June and July 1983). Also $2.95 for Volume II, Number 3 (October 1983). In addition, there is a $3.50 charge *per order* for postage and handling if sent by United Parcel Service and $6 for orders sent U.S. Mail. UPS *will not* deliver to a post office box or to another country. This charge applies whether you want one back issue or all of them.

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```
10 PRINT"EXAMPLE": FORX=ATO M:FORY=STO
P:Z=X+Y:PRINTZ:NEXTY:NEXTX
```

Into this: –

```
10 PRINT "EXAMPLE":
    FOR X = A TO M:
        FOR Y = S TO P:
            Z = X + Y:
            PRINT Z:
        NEXT Y:
    NEXT X
```

With one simple command.

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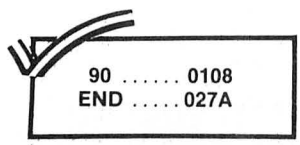
Format Your Video With This Worksheet

By George E. Klement

Good screen formatting will add a great deal of interest when planning your programs. Here is a simple utility program called *Video Worksheet* that will provide a printout of video screen positions as an aid in programming *PRINT@* locations.

The program starts with a prompt, asking for number of copies. (Remember to have a sufficient amount of paper in the printer.) Then press ENTER. A counter on the screen shows what your CoCo has sent to the printer by copy number. The program ends when the counter matches the input number.

An EPSON MX-80 printer was used for this utility set for 9600 Baud. This may require a *POKE* number change to match your printer, or just delete line #1. Also line 130 has Printer Control Code (140) that may not be compatible. This code tells the printer to form feed to the end of each page. Other than that, make as many copies as you wish. This is a good way to reuse the back side of printouts you may be recycling for scratch paper, if they haven't already been separated.



The listing:

```
1 POKE 150,1'WRKSHT  2/15/83
10 CLS:PRINT@136,"VIDEO WORKSHEE
T":G=0
20 PRINT@230,"NUMBER OF COPIES:"
;
30 INPUT Q
40 IF G>0 THEN PRINT@423,"COPY#"
;:PRINT@428,G;"COMPLETE"
50 PRINT@331,"PRINTING"
60 IF G>=Q THEN END
70 G=G+1:C=0
80 PRINT#-2:PRINT#-2,TAB(30)STRI
NG$(19,"*")
90 PRINT#-2,TAB(30)"* VIDEO WORK
SHEET *"
100 PRINT#-2,TAB(30)STRING$(19,"
*"):PRINT#-2:PRINT#-2
110 PRINT#-2,TAB(30)"1 1 1 1 1 1
 1 1 1 2 2 2 2 2 2 2 2 2 3 3
"
120 PRINT#-2,TAB(10)"0 1 2 3 4 5
 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
 2 3 4 5 6 7 8 9 0 1"
130 FOR T=1 TO 17:PRINT#-2,TAB(7
)STRING$(67,"-"):IF T>=17 THEN P
RINT#-2,CHR$(140);:GOTO 40
140 IF C<32 THEN Y=6
150 IF C>=32 AND C<=96 THEN Y=5
160 IF C>96 THEN Y=4
170 PRINT#-2,TAB(Y)C;
180 FOR N=1 TO 33:A$=": ":PRINT#
-2,TAB(9)A$;:NEXT N
190 C=C+32:PRINT#-2:NEXT T
```

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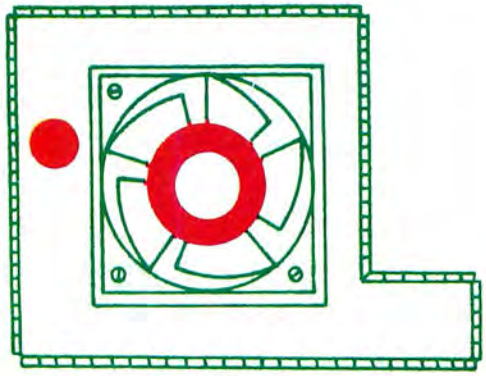
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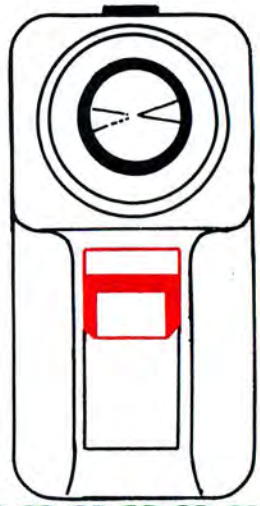
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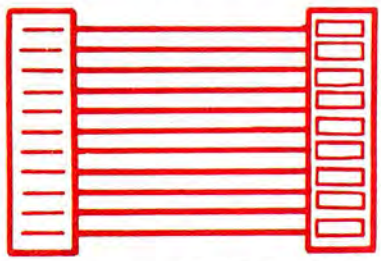
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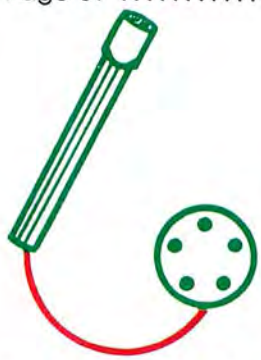
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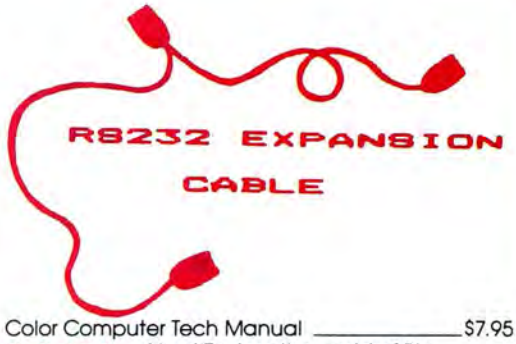
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Development Of A New Fantasy Game



By Bill Nolan
Rainbow Contributing Editor

Last month I got a little ahead of myself in this column. If you recall, there is a combat program we have been working on here, and the first barebones version was published last month. The reason I may have been ahead of myself is simple. The combat system used in the program is—as I mentioned—not like any currently in use. In fact, the combat system you saw last month was excerpted from a game in development. In this column, I will give you some general material about the game we are developing and provide you with a program for rolling up characters suitable to the new game. You may well prefer to continue playing whatever fantasy game you play now, but it won't hurt to see how a new game develops.

In this new game (for which we need a name—any suggestions?) there are eight basic character ability scores. These are:

1. physical beauty
2. intelligence
3. faith
4. agility
5. speed
6. manipulation
7. stamina
8. strength

Each of these abilities is determined by rolling five four-sided dice and totaling the three highest. This results in scores from three to 12, heavily weighted toward the top. The top weighting results from an assumption that player adventurers will be superior individuals. After all, if they were average they would choose an easier life.

Hit points are found by totaling strength, stamina, and faith, and as the player character rises in level an adjustment is made. Force points are determined by adding together the scores for stamina, faith, and intelligence, with an adjustment for level. Force points are a measure of mental strength and atunement with the forces of nature, and are used to figure saving throws and in the magic system.

The magic system is completely new, since I think that the present magic systems are the weak links in many games. In our new game there are several ways of practicing magic, and these are referred to by color, as in white magic, black magic, green magic, red magic, and so on for most colors. Within each color there are three types of character classes, and these are the arcanist, the guardian, and the champion. The arcanist is a dedicated student of a certain color of magic, the guardian is sort of a keeper of the faith, and the champion is a fighter dedicated to the cause. There are also several classes of characters who are not aligned with any particular color, and some of these classes are the fighter, the thief, and the rogue. The rogue is a sort of charismatic fighter with thieving abilities.

I hope that this general overview will help you to keep the combat system in perspective as we continue working on it. One of these days, we will finish the new game, and then we can all try it out. One of the main ways it is different is that it is designed from the start to be played with the help of computer programs, and as we proceed, you will be surprised at how many things that affects.

Meanwhile, back at the combat system, we were working on critical hit and fumble tables. For those of you not familiar with these tables, let me explain them a bit.

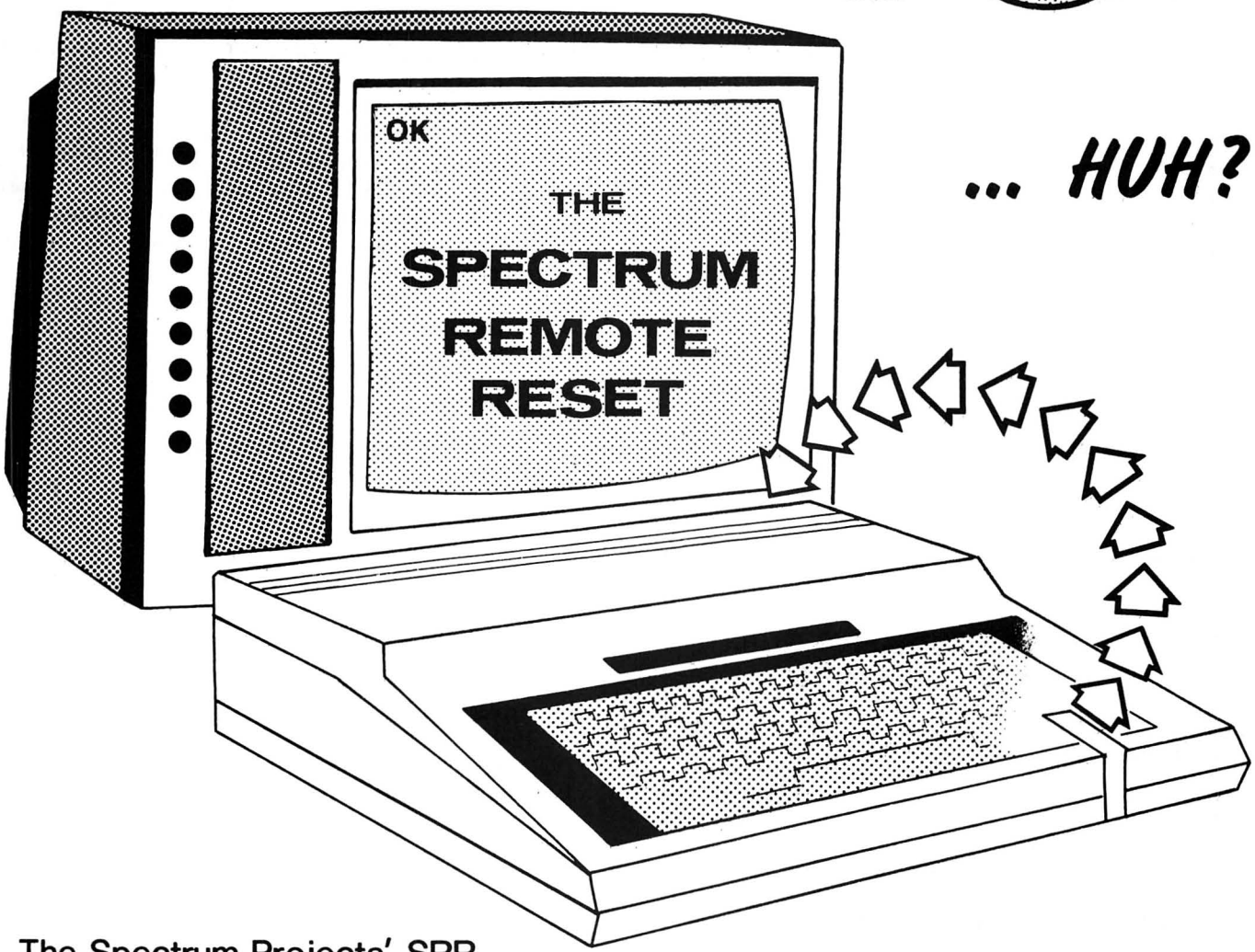
Almost every combat system I have ever seen for a fantasy game involves dice, and one of the rolls you make is your roll to hit. A number is computed by some method (often by looking it up on a table of numbers called a "to hit" chart), and the player taking a swing must roll that number or higher in order to hit his target. For example, let us suppose that one player's fighter is a low level type while his opponent is several levels higher and is also more agile and has better armor. Aside from the fact that the first fighter is probably in over his head, we can assume several things. The bottom line, as they say, is that it will be much easier for the second fighter to score a hit with his sword than for the first fighter to do so. A combat system is nothing more than a means of reducing this to some sort of numerical chance.

Let's suppose that we determine—using our favorite combat system—that the first fighter has 1 chance in 3 of hitting the second, while the second has 2 chances in 3 of hitting the first. In terms of dice, that would mean that fighter number 1 must roll a 21 or higher on a die having 30 sides in order to score a hit, while fighter number 2 needs to

---

(Bill Nolan is a principal in Prickly-Pear Software. He teaches computer science at a local college and referees a weekly fantasy game.)

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' or higher on the same 30-sided die. Of course, your ...cular combat system may call for the use of a die having 20 sides, or even two dice giving a range of 1 to 100 (percentile dice), but the principle is the same.

If fighter 1 rolls a 21, he has hit, and if he rolls a 20 he misses. That seems simple enough, but suppose he misses terribly. Suppose he rolls a 1, which represents the absolute worst possible swing he can make. It has always seemed logical to many gamers that there should be some difference between missing your roll by 1 and missing it by 20. At the other end of the situation, suppose our intrepid fighter rolls a 30 for a perfect hit. Is a perfect hit to go unrewarded?

The answer to both of these problems comes in the form of a set of two tables. The first is a FUMBLE table and is referred to whenever a player makes the worst possible roll —usually a 1. When this happens, the player rolls again and looks up the result on the fumble chart. That result may be anything from falling on your own sword to dropping your weapon. The other chart—the CRITICAL HIT table, is referred to whenever you roll the best possible roll, and here the result is beneficial to the fighter.

Below are the two tables. These are not cast in bronze, so if you have any suggestions for improvements, let me know. Both tables are set up for a 30-sided die, and thus give 30 possibilities.

FUMBLE TABLE

1. fell on your weapon and were killed
2. fell on your weapon for 1D20 damage
3. fell on your weapon for 1D12 damage
4. fell on your weapon for 1D10 damage
5. fell on your weapon for 1D8 damage
6. fell on your weapon for 1D6 damage
7. fell on your weapon for 1D4 damage
8. broke your weapon—even if magical
9. broke your weapon—if magical loses 1 plus
10. broke your weapon—if magical no effect
12. slipped and fell—no attack for 2 rounds
13. slipped and fell—no attack for 1 round
14. slipped and fell—attack at -2 next round
16. slipped and fell—attack at -1 next round
17. sprained wrist—can't hold weapon in that hand
18. sprained ankle—attack at -2 for rest of fight
19. broke your ankle—can't stand up
20. wrenched your knee—dexterity bonus is reduced by 4 even if that makes it minus
21. dropped your weapon—must draw another
22. dropped your weapon—can recover in 2 rounds
23. dropped your weapon—can recover in *one round*
24. fell on your back hard—all items on your back must save vs. crushing blow and no attack next round
25. left yourself open and opponent adds 5 to his roll this round
26. left yourself partially open and opponent adds 2 to his roll this round
27. fell and hit your head—stunned for 2 rounds
29. fell and hit your head—stunned for 1 round
30. no bad effect

CRITICAL HIT TABLE

1. no special effect
2. stunned your opponent for 1 round
3. stunned your opponent for 2 rounds
4. disarmed your opponent—he must draw another weapon
5. disarmed your opponent—2 rounds to recover
6. disarmed your opponent—1 round to recover
7. your opponent was open—double your damage
8. broke your opponent's wrist—he can't attack with that hand
9. broke your opponent's ankle—he can't stand
10. sprained your opponent's ankle—he's -2 to hit for the rest of the fight
11. your opponent broke his weapon
12. damage is plus 1D20
13. damage is plus 1D12
14. damage is plus 1D10
15. damage is plus 1D8
16. damage is plus 1D6
17. damage is plus 1D4
18. knocked your opponent down—he can't attack for 2 rounds
19. knocked your opponent down—he can't attack for 1 round
20. knocked your opponent down—he is -2 next round
21. knocked your opponent down—he is -1 next round
22. your blow landed on the forehead—opponent is blinded by the blood, and attacks at -4 for the rest of the fight
23. you get another attack this round
24. opponent is confused—you get an extra attack next round
25. the god of war was impressed and takes a hand—you are plus 2 for the rest of the fight
26. you inspire your companions—they are all plus 1 next round

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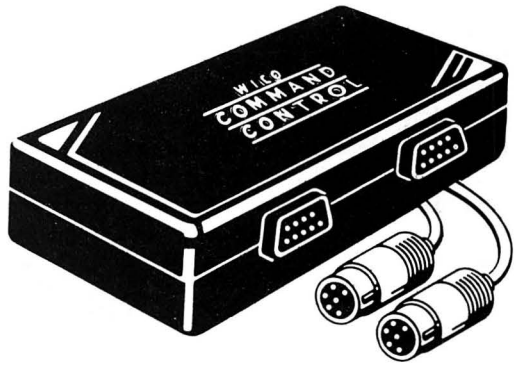
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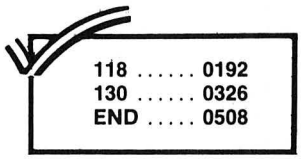
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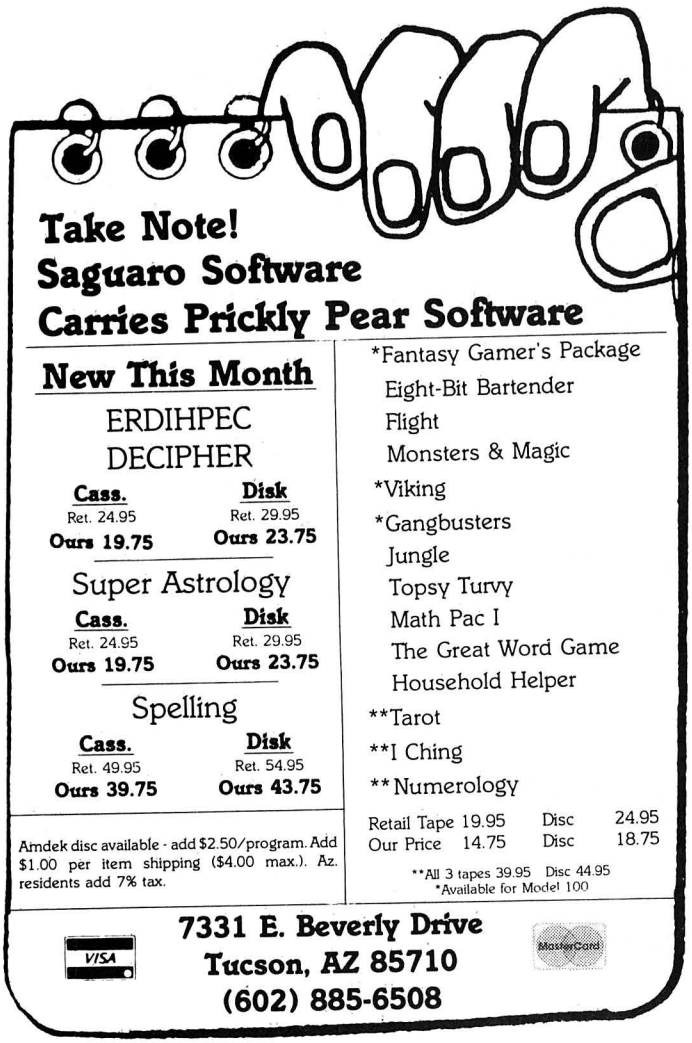
27. opponent is demoralized and fights at -1 for the rest of the fight
28. opponent is severely demoralized and fights at -3 for the rest of the fight
29. opponent flees in panic if able
30. opponent is killed outright

NOTE: In some instances, the effects will have to be adjusted by the game referee to take account of the current situation.

Well, that's the tentative fumble and critical hit charts. Below is a program that rolls the characteristics of our new type player and also tells you what classes and races the player qualifies to be. If you are interested in the new game, let me know. If enough people are interested, I will develop it into a complete gaming system in the coming months. It's a good system, and we are already using it here. So long 'til next time. Write me in care of Prickly-Pear Software.




```
3 'COPYRIGHT 1983 BY BILL NOLAN.
  ALL RIGHTS RESERVED!!!
5 X=RND(-TIMER)
10 DIM C(8),C$(8)
20 FOR X=1 TO 8:READ C$(X):NEXT
100 CLS:PRINT" PRESS ANY KEY TO
ROLL":K$=INKEY$:GOSUB 9000:PRINT
" COMPUTING ROLL";:GOSUB 199
110 CLS:FOR X=1 TO 8:PRINTC$(X),
C(X):NEXT X
112 HP=C(3)+C(7)+C(8):PRINT"HIT
POINTS",HP:CC=0
115 IF C(1)>9 AND C(2)>9 AND C(4
)>7 AND C(5)>8 AND C(6)>9 AND C(
7)>8 AND C(8)>8 THEN PRINT" ROGU
E",:CC=1
118 IF C(5)>6 AND C(7)>8 AND C(8
)>8 THEN PRINT" WARRIOR",:CC=1
120 IF C(2)>7 AND C(4)>7 AND C(5
)>8 AND C(6)>9 THEN PRINT" THIEF
",:CC=1
122 IF C(2)>9 AND C(3)>8 AND C(6
)>8 AND C(7)>7 THEN PRINT" ARCAN
IST",:CC=1
124 IF C(2)>8 AND C(3)>11 THEN P
RINT" GUARDIAN",:CC=1
126 IF C(2)>9 AND C(3)>10 AND C(
4)>9 AND C(5)>9 AND C(7)>9 AND C
(8)>9 THEN PRINT" CHAMPION",:CC=
1
127 IF CC=0 THEN PRINT" COMMONER
",
128 IF C(1)>10 AND C(2)>9 AND C(
5)>9 AND C(6)>9 THEN PRINT" ELF"
,
129 IF C(8)>7 THEN PRINT" DWARF"
,
130 PRINT:PRINT"PRESS 'R' TO RER
OLL OR 'G':PRINT"TO GO ON.";:K$
=INKEY$
140 K$=INKEY$:IF K$<>"R" AND K$<
>"G" THEN 140 ELSE SOUND 150,1:I
F K$="R" THEN 100
199 FORC=1TO8:C(C)=0:FORC=1TO8:D
1=RND(4):D2=RND(4):D3=RND(4):D4=
RND(4):D5=RND(4)
200 HH$(1)=STR$(D1):HH$(2)=STR$(
D2):HH$(3)=STR$(D3):HH$(4)=STR$(
D4):HH$(5)=STR$(D5)
210 FOR X=1 TO 4:IF HH$(X)>HH$(X
+1) THEN 250
220 NEXT X
230 C(C)=(VAL(HH$(3))+VAL(HH$(4)
)+VAL(HH$(5)))
240 PRINT".";:NEXT C:RETURN
250 X$=HH$(X):HH$(X)=HH$(X+1):HH
$(X+1)=X$:GOTO210
9000 IF INKEY$="" THEN X=RND(0):
GOTO 9000:ELSE SOUND 150,1:RETUR
N
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PIPELINE

OS-9 IS REALLY taking off, as we predicted here that it would once Radio Shack came out with its official version. The Microware OS-9 seminar early in August was a crowded affair and the enthusiasm was everywhere! What we're hearing is that OS-9 will, in reality, make the Color Computer the "machine for everyone." On the most simple level, you can use CoCo to just run programs that you purchase (and there are more than a thousand of them now available and more coming in every day), or you can program — which will usually require an Extended Color BASIC machine with more than 16K of memory. Farther down the road, there is assembly language programming and OS-9, which is a full-blown disk operating system. The ability to use OS-9 on a multi-user and multi-tasking system is important to the family which wants two computers but only one set of software. Our hat's off to Radio Shack for bringing OS-9 to the CoCo!

If you doubt the impact introduction of OS-9 and the new CoCo product lines will have on the world of computers, as well as the CoCo Community, then just take a look at these figures which come from the well-respected *Science Digest*. In a recent survey of 12,000 persons, *Science Digest* found that 36 percent owned a personal computer and that 56 percent planned to purchase one within the next year. But, of even more significance, 80 percent look for memory when buying a computer, 79 percent survey expansion capability and 77 percent make or will base their choice on software availability. Sounds like they're talking about CoCo.

Also on the OS-9 front, the first program to hit the market specifically for the Radio Shack version of OS-9 has already been announced. It is by Frank Hogg Laboratory and is called *O-Pak*, a combination high resolution screen (with a number of options) and a set of utilities. One of the most useful utilities: One which will copy files between the Hogg Flex system, Radio Shack's OS-9 and the standard Radio Shack disk formats.

Also on the subject of OS-9, we're proud to report that our new columnist, Dale Puckett, has been elected president of the National OS-9 User's Group. One of Dale's objectives is to integrate the OS-9 User's Group with Color Computer Clubs across the world.

YOU'VE READ ON THESE pages about the departure of Jon Shirley as Vice President for Computer Merchandising at Radio Shack. Now, new appointments for three senior Radio Shack executives have been announced in Fort Worth.

Ed Juge, who has been Director of Computer Merchandising, becomes Director of Merchandising — Business Computer Products. Mark Yamagata, Director of Merchandising in the United Kingdom, is now Director of Merchandising — Personal Computer Products. Bill Wash, Director of Customer Service, has been named to be Director of Computer Merchandising Services.

CoCo (and the Portable Computer) fit under the aegis of Mr. Yamagata. He has worked with Tandy in Japan and the United States before his assignment to head up the UK operation. He joined Tandy/Radio Shack in 1968.

In making the announcements, Radio Shack said the new organization was done to "direct more intensive management support to specific TRS-80 computer product segments." Juge, Yamagata and Wash will report to Bernard Appel, Radio Shack's Executive Vict President — Marketing.

WHILE ON THE SUBJECT of Radio Shack, a new and important product has been announced in the education field. It is a card reader, which will read data from marked or punched cards. The card reader will then transfer the data to a computer — via an RS-232 —for use with an appropriate applications program. Card readers are one way in which educators can quickly grade tests and make surveys important in the education process. So, this represents a significant step for Radio Shack. The card reader is affordable, too, for such a complicated piece of hardware — $1,595.

SEVERAL FIRMS IN THE United States are announcing agreements to sell their products overseas, particularly in the British market, where the Dragon-32 is popular.

Superior Graphic Software says that it signed an agreement with Eurosoft for European marketing; Nelson Software's *Super Color Writer II* has been chosen as the "official" word processor for the Dragon to be introduced in this country by Tano Corp.; and Nanos Systems Corp. has now produced a reference card for the Dragon similar to that it made up several years ago for CoCo.

The Rainbow hasn't been left behind, either. We've just signed a major deal for international distribution in Europe, Africa, Asia and Australia.

A NEW FORMS processing program is now available from Derringer Software of Florence, SC. The program allows the merger of data files and letters. Just in time for the upcoming elections next year!

WE DON'T EVEN BELIEVE this, but there's a new product available called the *Byte Bat* from MicroTie Systems Corp. This is a foam rubber bat that lets you "slug" your CoCo when things go wrong — without hurting CoCo. A Byte Bat is $12.95 by mail at P.O. Box 8112, Walnut Creek, CA 94546.

IF YOU WANT to let CoCo earn you some money, try *Home Computer Business Reports* at P.O. Box 4759, Santa Barbara, CA 93103. These reports will show ways that you can make your computer make money for you. Some of the ideas are fairly common, others pretty unique. A catalog is available for just $1.

NOW THERE IS *The Computer Newsletter*, with a digest of all sorts of information on computers. And, because CoCo is *so* big, it even has an edition of its own! It costs $17.50 a year in the U.S., $20 in Canada and can be ordered at P.O. Box 952, Cleveland, OH 44120. Be sure to mention that you want the CoCo edition, as there are several others.

A UNIQUE SOFTWARE catalog is offered by a firm called Questron, P.O. Box 576, South Holland, IL 60473. Their catalog of CoCo software is in the form of a tape, which lets you get an "advance look" at what games, utilities and art programs actually do. The catalog costs $2, but comes with a free program.

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16K Cass $24.95 32K Disk $26.95

MONEY †

Grade 2-4. Provides an opportunity to count coins. 5 skill levels range from counting only dimes, nickels and pennies to counting various combinations of all coins which can total more than one dollar. The program uses graphic coins. If a series of 3 problems are answered correctly a rocket ascends to the moon. If 1 or more are incorrect, the rocket crashes instead.
16K Cass $19.95 16K Disk $21.95

BORROW †

Grades 2-4. Allows the student to reinforce subtraction skills. Problems appear in large graphic numerals. Small boxes above the numerals allow for regrouping procedures. 7 skill levels. A happy face appears on the screen for each correct answer. After 10 completed problems, a Pac-Man-type creature munches a numeral down.
16K Cass $19.95 32K Disk $21.95

CARRY †

Grades 2-4. A program designed to help students to practice addition. Uses same format as Borrow. 4 skill levels.
16K Cass $19.95 32K Disk $21.95

QUESTION

Grades 1-8. Asks questions with multiple choice or true and false answers. Fits any curriculum because you can input the questions and answers. Graphic reward is a blinking robot. Also designed for use with data tapes. Printer use optional.
16K Cass $19.95 32K Disk $21.95

MATHFACT †

Grade 1-5. Motivates students to learn their facts. All 4 math operations are in the program. Student selects the desired operation then the desired addend, subtrahend, factor or divisor, or then can request a mixed presentation within each operation. 2 skill levels, all drills timed and scored. If all facts are answered correctly, students can play a quick number game as a reward.
16K Cass $16.95 32K Disk $18.95

HANGWORD & SCRAMBLE

Grades 1-8. Presents 2 word games. Hangword is similar to the old favorite, Hangman. Blanks appear and students guess letters for the blanks. Wrong guesses build the graphic display of the word 'Sorry'. Scramble displays the word with the letters scrambled. Students guess the word and spell it correctly. Input own words with this program or purchase data tapes. See data tape listing. Printer use optional.
16K Cass $14.95 32K Disk $16.95

SPELLING

Grades 1-8. Very flexible as it allows you to input your own choice of words and store them on tape files. You may also purchase data tapes for this program. See data tape listing. Words flash on the screen from .1 to 10 seconds, then student types the word. The score is given after each entry and the student is rewarded with a graphic display of words and a song. Printer use optional.
16K Cass $16.95 32K Disk $18.95

KEYBOARD



Grades 1-6. Helps familiarize student with keyboard. A graphic keyboard enables user to locate keys quickly. Home keys are identified and proper fingering may be taught. Lessons are built around alphabet, finger, word and sentence drills. At the end a graphic reward is given. 32K version has lengthier timed drills. Both 16K and 32K versions can use data tapes for further practice. See data tape listings.
16K Cass $19.95 32K Cass $24.95 32K Disk $26.95

ABC'S

Grades K-1. The child types the letters in the alphabet to the tune of the alphabet song. The reward is a graphic and sound display.
16K Cass $9.95 16K Disk $11.95

SKIP COUNTING

Grades 1-4. Helps the child learn to count by 1's, 2's, 5's, 10's, 100's, or any number desired. The user selects the parameters by giving the number to count by and the beginning and ending number of each sequence. The student can practice at whatever level needed, and each lesson has a graphic reward.
16K Cass $16.95

DATA TAPE LISTINGS

Data Tapes may be used with other B5 programs. They cannot be used alone.

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____	KEYBOARD	____
____	BORROW	____
____	ABC's	____
____	SPELLING	____

QTY.	DATA TAPES	AMT.
____	KEYBOARD PHONIC DRILL	____
____	DOLCH WORDS	____
____	GRADE LEVEL SPELLING	____
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Color Sketch

A Keyboard Graphics Utility

By Darryl Kotcher

Though the Color Computer has excellent capabilities as far as creating graphics goes, many times it is useful to view the graphic as it is being drawn in order to insure accuracy. *Colorsketch* allows one to do this.

Using the arrow keys and several one-key commands, excellent sketches can be drawn, and with enough persistance, can even compare to those obtainable on a graphics tablet.

Here are the commands that are available with *Colorsketch:*

B — Move cursor but don't draw (blank)
C — Move cursor and draw (color)
E — Exit from drawing
H — Display help table (this list)
I — Alter high speed cursor increment
M — Change graphics mode *(PMODE)*
N — Disengage key repeat (no repeat)
O — Origin of circle to be drawn
P — Paint an enclosed section
R — Engage key repeat
S — Define line starting point
T — Draw line from starting point (terminating point)
X — Change cursor color

Upon loading and running the program the user is prompted with questions about which mode *(PMODE0—4)* color set (0 or 1), foreground and background colors (within limits of given *PMODE*), and starting point on screen (0—255, 0—191). After this initial information is entered the user is shown the help table (which can be called at any time simply by hitting the H key) and asked to hit any key to continue. The user is then asked if an old picture is to be loaded. If the answer is yes, then the user is prompted to set up tape and hit ENTER to load. The graphics screen will be displayed and the old picture will be loaded in with the cursor located at the predefined location. If no is selected, the graphics screen is immediately displayed and cleared with the cursor positioned at the predefined location. At this point the user is now ready to put *Colorsketch* to work.

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Hit H and look at the help table. See all those other commands available? Those are where the real power of *Colorsketch* lies. Hit any key and return to the graphics screen. Move the cursor anywhere and hit S. Now move it anywhere else and hit T. Presto, a line is drawn between the two points. Now draw a box and place the cursor within. Hit P and follow the instructions for painting shown. The lower right corner will show you which mode (PM) and color set (CS) you're in. When you are returned to the graphics screen you will find your box now painted if you followed the instructions and used an allowable color. Now using <SHIFT> and any arrow key move the cursor quickly to another location and hit O. You are now prompted with the information needed for Extended BASIC's *CIRCLE* command. When all are answered and you are returned to the graphics screen a circle with origin at the cursor will now be drawn. Now use the M key to switch to one of the four color modes. Hit X and change the cursor to another color and draw a small line. Hit X again and draw another line using a different color. Using this technique, one can draw very colorful drawings.

The program is written in as structured BASIC as I found feasible and thus is easily modified. I hope you find as many uses for this program as I have. CoCo's can create some impressive graphics and this program will only make it easier. If anyone encounters any problems or any questions regarding this program, feel free to contact me at (313) 981-3825. Good luck and happy sketching!

(Darryl Kotcher is a senior at Eastern Michigan University, majoring in computer-science. Upon graduation, he hopes to continue working with Micros, possibly software development.)

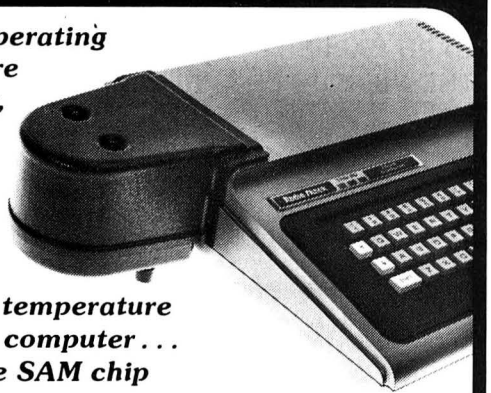
		100	09F2
		130	0C2E
22	019C	158	0E2A
43	02E5	186	108C
62	051D	208	1272
80	0781	END	1497

The listing:

```
1 ' ***** COLORSKETCH *****
2 '
3 POKE 65495,0
```

```
84 IF A$="N" THEN SOUND 200,1:RF
=0
85 IF A$="B" THEN SOUND 200,1:FL
=1
86 IF A$="H" THEN SCREEN 0,1:SOU
ND 200,1:GOSUB 63:SCREEN 1,VAL(C
S$)
87 IF A$="E" THEN SOUND 200,1:GO
TO 38
88 IF A$="C" THEN SOUND 200,1:FL
=0
89 IF A$="\" THEN SOUND 200,1:GO
SUB 220:PSET(X,Y)
90 IF A$="S" THEN SX=X:SY=Y:SOUN
D 200,1
91 IF A$="T" THEN TX=X:TY=Y:SOUN
D 200,1: GOSUB 174
92 IF A$="O" THEN SOUND 200,1:GO
SUB 181
93 IF A$="X" THEN SOUND 200,1:GO
SUB 198
94 IF A$="I" THEN SOUND 200,1:GO
SUB 206
95 IF A$="M" THEN SOUND 200,1:GO
SUB 212
96 IF A$=CHR$(U) THEN X1=X:Y1=Y:
Y=Y-1
97 IF A$=CHR$(L) THEN Y1=Y:X1=X:
X=X-1
```


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```
98 IF A$=CHR$(D) THEN X1=X:Y1=Y:
Y=Y+1
99 IF A$=CHR$(R) THEN Y1=Y:X1=X:
X=X+1
100 IF A$=CHR$(95) THEN Y1=Y:X1=
X:Y=Y-NI
101 IF A$=CHR$(91) THEN Y1=Y:X1=
X:Y=Y+NI
102 IF A$=CHR$(21) THEN Y1=Y:X1=
X:X=X-NI
103 IF A$=CHR$(93) THEN Y1=Y:X1=
X:X=X+NI
104 IF A$="" THEN 81
105 IF X>255 THEN X=255
106 IF X<0 THEN X=0
107 IF Y>191 THEN Y=191
108 IF Y<0 THEN Y=0
109 RETURN
110 '
111 '
112 ' ***** SUBROUTINE TO SAVE P
ICTURE *****
113 '
114 CLS
115 POKE 65494,0
116 PRINT "SAVE PICTURE (Y/N)?";
117 SCREEN 0,1
118 S$=INKEY$:IF S$<>"Y" AND S$<
>"N" THEN 118
119 IF S$="Y" THEN 122
120 PRINT " ";S$
121 GOTO 134
122 M=VAL(M$)
123 PRINT " ";S$
124 IF M=0 THEN M=1
125 PRINT
126 PRINT "POSITION TAPE":PRINT
"HIT ANY KEY TO TAPE"
127 SCREEN 0,1
128 T$=INKEY$:IF T$="" THEN 128
129 PRINT:INPUT "NAME";NM$
130 LTH=1536*M+1535
131 PRINT:PRINT "SAVING WITH NAM
E=";NM$
132 SCREEN 0,1
133 CSAVEM NM$,1536,LTH,1536
134 RETURN
135 '
136 '
137 ' ***** SUBROUTINE TO LOAD O
LD PICTURE *****
138 '
139 PRINT:PRINT "SET UP TAPE, HI
T ENTER TO LOAD"
140 SCREEN 0,1
141 T$=INKEY$:IF T$="" THEN 141
142 SCREEN 1,VAL(CS$)
143 PCLS
144 POKE 65494,0
145 CLOADM
```

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		130	0C2E
22	019C	158	0E2A
43	02E5	186	108C
62	051D	208	1272
80	0781	END	1497

The listing:

```
1 ' ***** COLORSKETCH *****
2 '
3 POKE 65495,0
```

```
4 PCLEAR 4
5 CLEAR 1200,&H7EFF
6 DEF USR=&H7F00
7 '
8 '
9 ' ***** MACHINE LANG. ROUTINE
FOR KEY REPEAT *****
10 '
11 FOR MM=&H7F00 TO &H7F1B
12 READ DT$
13 DT$="&H"+DT$
14 POKE MM,VAL(DT$)
15 NEXT
16 DATA CC,0,0,8E,1,55,A6,80,8D,
9,8C,1,59,26,F7,4F,7E,B4,F4,81,F
F,2D,1,39,CC,0,1,39
17 '
18 '
19 ' ***** MAIN PROGRAM *****
20 '
21 A$="":NI=10
22 GOSUB 227:CLS
23 GOSUB 152
24 GOSUB 63
25 CLS
26 PRINT "LOAD OLD PICTURE (Y/N)
?"
27 SCREEN 0,1
28 AN$=INKEY$:IF AN$<>"Y" AND AN
$<>"N" THEN 28
29 IF AN$="Y" THEN GOSUB 139:GOT
O 32
30 PCLS
31 SCREEN 1,VAL(CS$)
32 U=94:D=10
33 L=8:R=9:RPT=0:RF=0
34 PSET (X,Y,C)
35 IF FL=1 THEN PRESET (X1,Y1)
36 GOSUB 78
37 GOTO 34
38 GOSUB 114
39 END
40 '
41 '
42 ' ***** SUBROUTINE TO PAINT *
****
43 '
44 PRINT "COLOR","NUMBER"
45 PRINT "-----","------"
46 PRINT "BLACK",0,"GREEN",1,"YE
LLOW",2,"BLUE",3,"RED",4,"BUFF",
5,"CYAN",6,"MAGENTA",7,"ORANGE",
8
47 PRINT:PRINT "COLOR SET 0=1ST
4 COLORS";"   PM=";M$:PRINT "COL
OR SET 1=2ND 4 COLORS";"   CS=";
CS$
48 PRINT "ONLY 0 OR 5 IN 2 COLOR
 MODES"
49 PRINT "TYPE NO. OF DESIRED CO
```

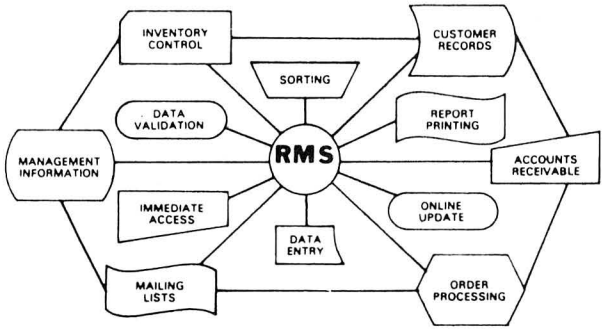

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```
LOR";
50 SCREEN 0,1
51 CR$=INKEY$:IF CR$<"0" OR CR$>
"8" THEN 51
52 PRINT@480, "BORDER COLOR TO S
TOP AT (0-8)?";
53 SCREEN 0,1
54 ST$=INKEY$:IF ST$<"0" OR ST$>
"8" THEN 54
55 BD=VAL(ST$)
56 SCREEN 1,VAL(CS$)
57 PAINT(X+2,Y+2),VAL(CR$),BD
58 RETURN
59 '
60 '
61 ' ***** SUBROUTINE TO PRINT T
ABLE *****
62 '
63 CLS
64 PRINT "     **** COMMAND TABLE
 ****"
65 PRINT"B-BLANK DRAW":PRINT "C-
RESUME COLOR":PRINT "P-PAINT ENC
LOSED SECTION":PRINT "E-EXIT FRO
M DRAWING"
66 PRINT "<SHIFT><CLEAR>-CLEAR S
CREEN":PRINT "R-ENGAGE KEY REPEA
T":PRINT "N-DISENGAGE KEY REPEAT
"
67 PRINT "S-LINE STARTING POINT"
:PRINT "T-LINE TERMINATING POINT
":PRINT "O-ORIGIN OF CIRCLE TO B
E DRAWN":PRINT "X-CHANGE CURSOR
COLOR"
68 PRINT "H-DISPLAY COMMAND TABL
E"
69 PRINT "M-CHANGE MODE"
70 PRINT "I-ALTER CURSOR MOVE IN
CREMENT":PRINT "HIT ANY KEY TO R
ESUME";
71 SCREEN 0,1
72 H$=INKEY$:IF H$="" THEN 72
73 RETURN
74 '
75 '
76 ' ***** SUBROUTINE TO MOVE CU
RSOR *****
77 '
78 IF RF=0 THEN 81
79 RPT=USR(0)
80 IF RPT=1 THEN 96
81 A$=INKEY$
82 IF A$="P" THEN SOUND 200,1:GO
SUB 44
83 IF A$="R" THEN SOUND 200,1:RF
=1
```


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```
84 IF A$="N" THEN SOUND 200,1:RF
=0
85 IF A$="B" THEN SOUND 200,1:FL
=1
86 IF A$="H" THEN SCREEN 0,1:SOU
ND 200,1:GOSUB 63:SCREEN 1,VAL(C
S$)
87 IF A$="E" THEN SOUND 200,1:GO
TO 38
88 IF A$="C" THEN SOUND 200,1:FL
=0
89 IF A$="\" THEN SOUND 200,1:GO
SUB 220:PSET(X,Y)
90 IF A$="S" THEN SX=X:SY=Y:SOUN
D 200,1
91 IF A$="T" THEN TX=X:TY=Y:SOUN
D 200,1: GOSUB 174
92 IF A$="O" THEN SOUND 200,1:GO
SUB 181
93 IF A$="X" THEN SOUND 200,1:GO
SUB 198
94 IF A$="I" THEN SOUND 200,1:GO
SUB 206
95 IF A$="M" THEN SOUND 200,1:GO
SUB 212
96 IF A$=CHR$(U) THEN X1=X:Y1=Y:
Y=Y-1
97 IF A$=CHR$(L) THEN Y1=Y:X1=X:
X=X-1
```


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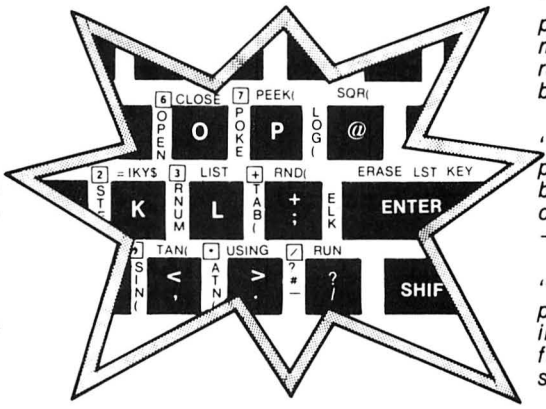

```
98 IF A$=CHR$(D) THEN X1=X:Y1=Y:
Y=Y+1
99 IF A$=CHR$(R) THEN Y1=Y:X1=X:
X=X+1
100 IF A$=CHR$(95) THEN Y1=Y:X1=
X:Y=Y-NI
101 IF A$=CHR$(91) THEN Y1=Y:X1=
X:Y=Y+NI
102 IF A$=CHR$(21) THEN Y1=Y:X1=
X:X=X-NI
103 IF A$=CHR$(93) THEN Y1=Y:X1=
X:X=X+NI
104 IF A$="" THEN 81
105 IF X>255 THEN X=255
106 IF X<0 THEN X=0
107 IF Y>191 THEN Y=191
108 IF Y<0 THEN Y=0
109 RETURN
110 '
111 '
112 ' ***** SUBROUTINE TO SAVE P
ICTURE *****
113 '
114 CLS
115 POKE 65494,0
116 PRINT "SAVE PICTURE (Y/N)?";
117 SCREEN 0,1
118 S$=INKEY$:IF S$<>"Y" AND S$<
>"N" THEN 118
119 IF S$="Y" THEN 122
120 PRINT " ";S$
121 GOTO 134
122 M=VAL(M$)
123 PRINT " ";S$
124 IF M=0 THEN M=1
125 PRINT
126 PRINT "POSITION TAPE":PRINT
"HIT ANY KEY TO TAPE"
127 SCREEN 0,1
128 T$=INKEY$:IF T$="" THEN 128
129 PRINT:INPUT "NAME";NM$
130 LTH=1536*M+1535
131 PRINT:PRINT "SAVING WITH NAM
E=";NM$
132 SCREEN 0,1
133 CSAVEM NM$,1536,LTH,1536
134 RETURN
135 '
136 '
137 ' ***** SUBROUTINE TO LOAD O
LD PICTURE *****
138 '
139 PRINT:PRINT "SET UP TAPE, HI
T ENTER TO LOAD"
140 SCREEN 0,1
141 T$=INKEY$:IF T$="" THEN 141
142 SCREEN 1,VAL(CS$)
143 PCLS
144 POKE 65494,0
145 CLOADM
```

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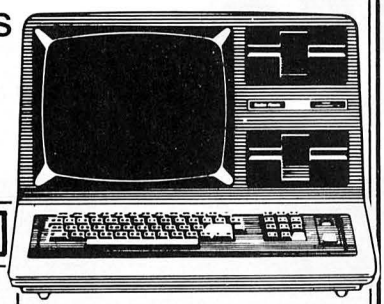
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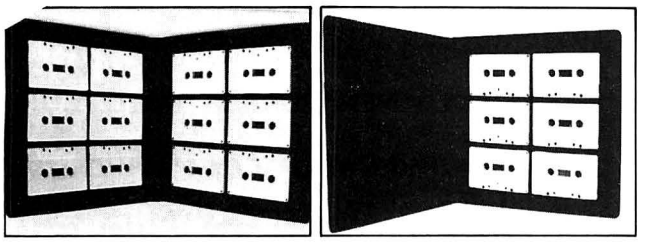
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```
146 POKE 65495,0
147 RETURN
148 '
149 '
150 ' ***** SUBROUTINE TO INPUT
STARTING DATA *****
151 '
152 PRINT "MODE (0-4)?";
153 M$=INKEY$
154 IF M$>"4" OR M$<"0" THEN 153
155 PRINT VAL(M$)
156 PMODE VAL(M$),1
157 PRINT "COLOR SET (0/1)?";
158 CS$=INKEY$:IF CS$<>"0" AND C
S$<>"1" THEN 158
159 PRINT VAL(CS$)
160 PRINT "FOREGROUND COLOR (0-8
)?";
161 FG$=INKEY$:IF FG$<"0" OR FG$
>"8" THEN 161
162 PRINT VAL(FG$)
163 C=VAL(FG$)
164 PRINT "BACKGROUND COLOR (0-8
)?";
165 BG$=INKEY$:IF BG$<"0" OR BG$
>"8" THEN 165
166 PRINT VAL(BG$)
167 COLOR VAL(FG$),VAL(BG$)
168 PRINT
169 INPUT"STARTING POINT";X,Y
170 RETURN
171 '
172 ' ***** SUBROUTINE TO DRAW L
INES *****
173 '
174 COLOR C,VAL(BG$)
175 LINE (SX,SY)-(TX,TY),PSET
176 COLOR VAL(FG$),VAL(BG$)
177 RETURN
178 '
179 ' ***** SUBROUTINE TO DRAW C
IRCLE *****
180 '
181 CLS
182 INPUT "RADIUS OF CIRCLE ";RD
183 INPUT "HEIGHT TO WIDTH RATIO
 (0.0-4.0) ";HW
184 IF HW<0 OR HW>4 THEN 183
185 PRINT "COLOR OF CIRCLE (0-8)
?";
186 C$=INKEY$:IF C$<"0" OR C$>"8
" THEN 186
187 PRINT " ";C$
188 INPUT "CIRCLE START POINT (0
-1) ";SP
189 IF SP<0 OR SP>1 THEN 188
190 INPUT "CIRCLE END POINT (0-1
) ";EP
191 IF EP<0 OR EP>1 THEN 190
192 CIRCLE (X,Y),RD,VAL(C$),HW,S
```

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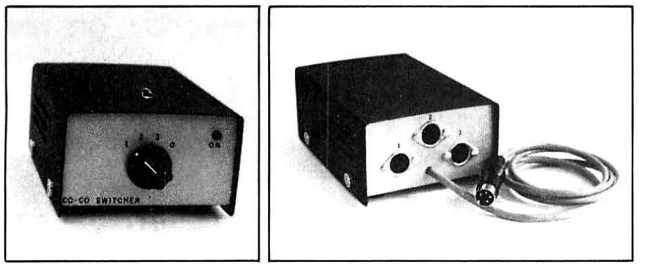


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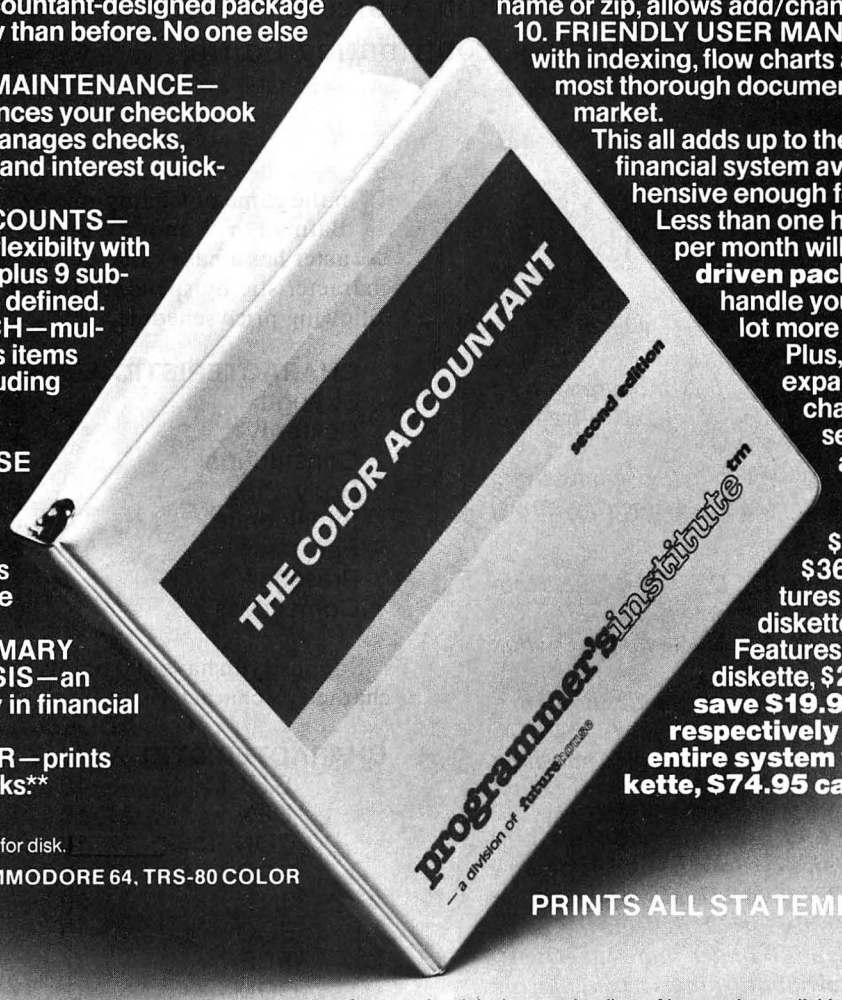

```
P,EP
193 SCREEN 1,VAL(CS$)
194 RETURN
195 '
196 ' ***** SUBROUTINE TO CHANGE
 CURSOR COLOR *****
197 '
198 CLS
199 PRINT "NEW CURSOR COLOR (Ø-8
)? "
200 CC$=INKEY$:IF CC$<"Ø" OR CC$
>"8" THEN 200
201 C=VAL(CC$):SCREEN 1,VAL(CS$)
202 RETURN
203 '
204 ' ***** SUBROUTINE TO CHANGE
 HIGH SPEED INCREMENT *****
205 '
206 CLS:INPUT "NEW INCREMENT ";N
I
207 SCREEN 1,VAL(CS$)
208 RETURN
209 '
210 ' ***** SUBROUTINE TO CHANGE
 MODES *****
211 '
212 CLS:PRINT "NEW MODE (Ø-4)? "
;
213 NM$=INKEY$:IF NM$<"Ø" OR NM$
>"4" THEN 213
214 PMODE VAL(NM$),1
215 SCREEN 1,VAL(CS$)
216 RETURN
217 '
218 ' ***** SUBROUTINE TO DELETE
 PICTURE *****
219 '
220 CLS:PRINT "REALLY DELETE (Y/
N)?":SCREEN Ø,1
221 AA$=INKEY$:IF AA$="" THEN 22
1
222 IF AA$<>"Y" THEN SCREEN 1,VA
L (CS$):RETURN ELSE PCLS:SCREEN
1,VAL(CS$):RETURN
223 '
224 '
225 ' ***** START-UP SCREEN ****
*
226 '
227 CLS
228 PRINT@192,STRING$(32,255)
229 PRINT@234,"COLORSKETCH"
230 PRINT@256,STRING$(32,175)
231 FOR DL=1 TO 1000:NEXT
232 PRINT@232,"BY DARRYL KOTCHER
"
233 FOR DL=1 TO 1000:NEXT
234 RETURN
235 END
```

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The Carefully Contrived Superhero

By Bob Albrecht
Rainbow Contributing Editor

FANTASY ROLE PLAYING GAMES

Millions of young people, and many not-so-young, are playing fantasy role playing games. A role playing game is a game in which one or more players create and control characters (adventurers) who live their imaginary lives in a specially made game world. The game world is created, managed, and operated by a GameMaster (GM), also called a referee, adventure master, or Dungeon Master (DM).

Most people who play role playing games use a formal rule system. Some of the best known are shown below.

Dungeons & Dragons (D&D). *From TSR Hobbies, P.O. Box 756, Lake Geneva, WI 53147.*
RuneQuest (RQ). *From Chaosium, P.O. Box 6302, Albany, CA 94706.*
Tunnels & Trolls (T&T). *From Blade, Box 1467, Scottsdale, AZ 85252.*
Worlds of Wonder (WOW). *From Chaosium, P.O. Box 6302, Albany, CA 94706*

BEGINNERS BEWARE! The rule books are very difficult to understand. If you are a beginner, first try ***Worlds of Wonder*** *or* ***Tunnels & Trolls.*** *Programs in "GameMaster's Apprentice" are based on the game system used in* ***Worlds of Wonder*** *and* ***RuneQuest.*** *For general information about fantasy role playing games, try the following book, excellent for beginners.*

Through Dungeons Deep *by Robert Plamondon. From Reston Publishing Company, 11400 Sunset Hills Road, Reston, VA 22090.*

Copyright (C) 1983 by DragonQuest, P.O. Box 310, Menlo Park, CA 94025. *Portions of "GameMaster's Apprentice" are from a book-in-progress called* ***Adventurer's Handbook: A Beginner's Guide to Role Playing Games.***

In the game of Champions,* you create a superhero like Batman or Wonder Woman or Spiderman. Your character has a base value of 10. You increase the value of a characteristic by spending Power Points according to the following price schedule.

CHARACTERISTIC	ABBREVIATION	PRICE
Strength	STR	1
Dexterity	DEX	3
Constitution	CON	2
Body Pips	BOD	2
Intelligence	INT	1
Ego	EGO	2
Presence	PRE	1
Comeliness	COM	.5

Suppose you have 100 points to spend on improving your character's characteristic. You might spend them like this:

CHARACTERISTIC	ADDED VALUE	PRICE	POINTS
STR	10	1	10
DEX	10	3	30
CON	10	2	20
BOD	0	2	0
INT	20	1	20
EGO	10	2	20
PRE	0	1	0
COM	0	.5	0
	TOTAL POINTS		100

*For information about *Champions*, contact Hero Games, 92A 21st Avenue, San Mateo, Calif., 94402.

(Bob Albrecht and George Firedrake are two of the most prolific authors in the microcomputer world today. Specialists in writing for beginners, they are authors of numerous books, including TRS-80 Color Basic.)

Write a program to help design a *Champions* superhero. When you type RUN, it might begin like this:

CHARACTERISTIC	VALUE	PRICE	POINTS
1 STR	0	1	0
2 DEX	0	3	0
3 CON	0	2	0
4 BOD	0	2	0
5 INT	0	1	0
6 EGO	0	1	0
7 PRE	0	1	0
8 COM	0	.5	0

TOTAL POINTS:

CHANGE WHAT (1 TO 8)?

Select a characteristic to change by pressing a number key from 1 to 8. The CoCo then asks:

NEW VALUE?

Type your new value and press ENTER. The new value appears on screen along with a new TOTAL POINTS. You can select a characteristic and enter a new value as many times as you want until you get the character you want, with exactly the number of TOTAL POINTS the GM said you could have.

We suggest you store information in arrays of subscripted variables, as follows.

CH$( )	for the characteristic abbreviations, STR, DEX, and so on.
TVAL( )	for the values of the characteristics.
PRICE( )	for the prices.
POINTS( )	for the total points, each trait.

For ideas on how to write this program look at our simpler program to contrive a *RuneQuest* character in the August, 1983 issue. We have the following outline in mind for this program.

```
100 REM**CONTRIVE A SUPERHERO
200 REM**SET UP FIXED ARRAYS
300 REM**SET TVAL ARRAY TO ZERO
400 REM**PUT WORKSHEET ON SCREEN
500 REM**CHANGE WHICH ONE?
600 REM**GET NEW VALUE
700 REM**COMPUTE TOTAL POINTS
800 REM**GO AROUND AGAIN
```

In block 500, you might want to include a way to start over. If someone presses 0, start over at block 300.

Roll A Character

In the February and March issues, we showed you several programs to roll the seven basic characteristics for a *RuneQuest* or *Worlds Of Wonder* character. There is always another way. The following program packs the abbreviations into a string RQ$, then picks them out as needed.

```
100 REM**CREATE A CHARACTER
110 RQ$="STRCONSIZINTPOWDEXCHA"
120 CLS

300 REM **ROLL THE CHARACTER
310 FOR K=0 TO 6
320 : CH$ = MID$(RQ$, 3*K+1, 3)
330 : GOSUB 910  'ROLL DICE
340 : PRINT CH$, DICE
350 NEXT K

400 REM**TELL HOW TO DO AGAIN
410 PRINT
420 PRINT "TO DO AGAIN, PRESS AN
Y KEY"
430 IF INKEY$ = "" THEN 430 ELSE
 120

900 REM**DICE SUBROUTINE
910 D1 = RND(6)
920 D2 = RND(6)
930 D3 = RND(6)
940 DICE = D1 + D2 + D3
950 RETURN
```

Also try the following variation for lines 310 and 320.

```
310 FOR K=1 TO LEN(RQ$)/3
320 : CH$=MID$(RQ$,3*(K-1)+1,3)
```

A *Dungeons & Dragons (D&D)* or *Tunnels & Trolls (T&T)* character has six characteristics, with slightly different abbreviations.

Dungeons & Dragons		Tunnels & Trolls	
Strength	(STR)	Strength	(STR)
Constitution	(CON)	Constitution	(CON)
Intelligence	(INT)	Intelligence	(INT)
Wisdom	(WIS)	Luck	(LK)
Dexterity	(DEX)	Dexterity	(DEX)
Charisma	(CHA)	Charisma	(CHR)

Your Turn

1) Modify our program for *D&D* or *T&T*.
2) Write a single program to roll the characteristics for a *D&D, RuneQuest,* or *T&T* character as selected by the user. It might start like this:

```
I CAN ROLL A CHARACTER FOR:
  DUNGEONS & DRAGONS     (D)
  RUNEQUEST              (R)
  TUNNELS & TROLLS       (T)
WHICH GAME (D, R, OR T)?
```

3) Replace the DICE SUBROUTINE with one of the variations shown in the March issue. Better yet, include several different DICE SUBROUTINES and let the user select one.

The Character File

In the August issue, we challenged you to write a CHARACTER FILE PROGRAM with character records stored in arrays of subscripted variables. Our program begins by reserving memory space and, using a subroutine, loading the arrays from *DATA* statements. We then present a menu and wait for someone to order.

```
100 REM**CHARACTER FILE PROGRAM
110 CLEAR 1000
120 DIM NAYM$(50),STR(50)
121 DIM CON(50),SIZ(50),INQ(50)
122 DIM POW(50),DEX(50),CHA(50)
130 GOSUB 13010 'LOAD ARRAYS

200 REM**TELL HOW TO USE
210 CLS
220 PRINT "YOU CAN FIND A CHARAC
TER RECORD"
230 PRINT "BY NAME OF CHARACTER
OR YOU CAN"
```

```
240 PRINT "SCAN THE ENTIRE CHARA
CTER FILE."
250 PRINT @128, "MENU:"
260 PRINT @194, "TO FIND A RECOR
D,    PRESS '1'"
270 PRINT @226, "TO SCAN ENTIRE
FILE, PRESS '2'"
280 PRINT @258, "TO RETURN TO ME
NU,   PRESS '0'"

400 REM**WAIT FOR KEYPRESS
410 KY$ = INKEY$
420 IF KY$="" THEN 410
430 IF KY$="1" THEN 1010
440 IF KY$="2" THEN 2010
450 IF KY$="0" THEN 210 ELSE 410
```

You can combine lines 120, 121, and 122 into a single long line. Line 130 calls the LOAD ARRAYS SUBROUTINE which begins with a REM statement in line 13000. Look for it in the subroutine section below. The character records are stored in *DATA* statements beginning at line 30000.

The program has two main modules, shown below.

MODULE 1

```
1000 REM**CHARACTER FINDER
1010 CLS
1020 INPUT "NAME$"; WHO$
1030 RN = 0 'RECORD NUMBER
1100 REM**LOOK FOR WHO$
1110 RN = RN + 1 'NEXT RECORD
1120 IF NAYM$(RN)<>WHO$ THEN 121
0
1130 GOSUB 12010 'DISPLAY RECORD
1140 GOTO 1310

1200 REM **CHECK FOR EOF
1210 IF NAYM$(RN)="ENDFILE" THEN
     1220 ELSE 1110
1220 PRINT "I DON'T KNOW " WHO$

1300 REM**TELL HOW TO DO AGAIN
1310 GOSUB 10010 'GET REQUEST
1320 IF KEY$="0" THEN 210 'MENU
1330 GOTO 1010 'DO AGAIN
```

MODULE 2

```
2000 REM**SCAN CHARACTER FILE
2010 CLS
2020 RN = 0 'RECORD NUMBER

2100 REM**DISPLAY NEXT RECORD
2110 RN = RN + 1
2120 GOSUB 12010 'DISPLAY RECORD

2200 REM**TELL HOW TO DO AGAIN
2210 GOSUB 10010 'GET REQUEST
2220 IF KEY$="0" THEN 210 'MENU
2230 IF NAYM$(RN)="ENDFILE" THEN
     2020 ELSE 2110
```

Both modules use subroutines that begin at lines 10000 and 12000. These are called in lines 1130, 1310, 2120, and 2210 above.

Three subroutines and the character records complete this program.

```
10000 REM**GET REQUEST SUBR.
10010 PRINT
10020 PRINT "TO DO AGAIN, PRESS
SPACE"
10030 PRINT "TO RETURN TO MENU,
PRESS '0';
10040 KEY$ = INKEY$
10050 IF KEY$="" THEN 10040
10060 IF KEY$=" " THEN RETURN
10070 IF KEY$="0" THEN RETURN
ELSE 10040

12000 REM**DISPLAY RECORD SUBR.
12005 REM**RN IS RECORD NUMBER
12010 CLS
12020 PRINT NAYM$(RN): PRINT
12030 PRINT "STR",STR(RN)
12040 PRINT "CON",CON(RN)
12050 PRINT "SIZ",SIZ(RN)
12060 PRINT "INT",INQ(RN)
12070 PRINT "POW",POW(RN)
12080 PRINT "DEX",DEX(RN)
```


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```
12090 PRINT "CHA",CHA(RN):RETURN

13000 REM**LOAD ARRAYS SUBR.
13010 RN = 0 'RECORD NUMBER
13020 RN = RN + 1 'NEXT RECORD
13030 READ NAYM$(RN),STR(RN),CON
(RN),SIZ(RN),INQ(RN),POW(RN),DEX
(RN),CHA(RN)
13040 IF NAYM$(RN)="ENDFILE"
THEN RETURN ELSE 13020

30000 REM**CHARACTER RECORDS
30010 DATA ALOYSIOUS
30011 DATA 10,11,10,12,10,12, 9
30020 DATA BAROSTAN
30021 DATA 17,17,13, 8, 7,15, 6
30030 DATA BRIDLA
30031 DATA 11,12,10,15, 6,11,16
30040 DATA DERNFARA
30041 DATA 13,13, 8,13, 4,17,13
30050 DATA JOLEEN
30051 DATA 13,11, 7,13, 8,17,13
30060 DATA ROKANA
30061 DATA  9, 9, 9,17,18, 9,10
30070 DATA ENDFILE
30071 DATA  0, 0, 0, 0, 0, 0, 0
```

Remember, when you enter this program, you can omit REM statements and comments following an apostrophe.

Coming Attractions

Surely, but slowly, we will explore the following things:

- The elusive RND
- GameMaster's Dice
- Looking up stuff in files. First, files of information in *DATA* statements and arrays. Next, cassette files. Eventually, disk files.
- Whatever else comes to mind or is suggested by you.

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Hint . . .

Saving In ASCII

When you save programs, CoCo can perform this function in two ways, by using binary codes or actual letters and numbers (called ASCII and pronounced AS-KEY).

Although it takes longer, ASCII sometimes is a more accurate way to save a program, especially when you may be transferring programs between systems—say from a disk-based to a cassette-based system.

To save in ASCII, simply add a comma and an "A" to the end of your "SAVE" instruction, like this: *CSAVE* "PROGRAM",A and the ASCII save will be done by CoCo.

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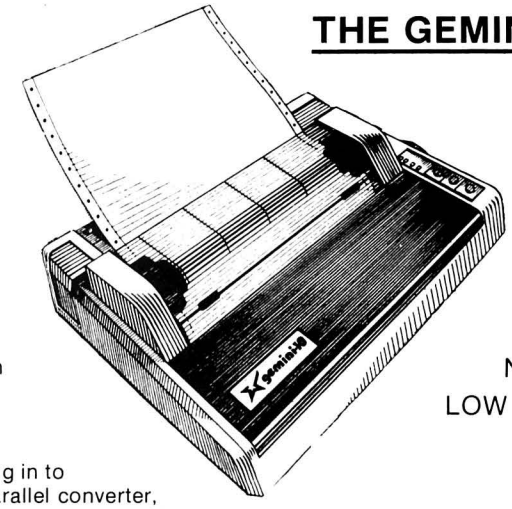
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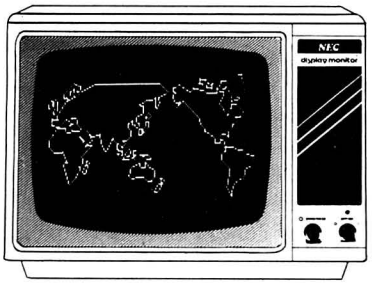
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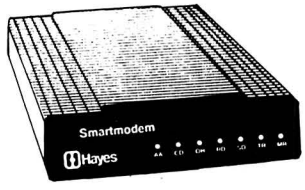


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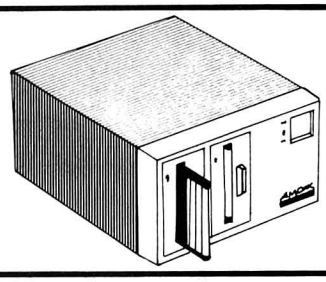
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The Power Of OS-9

(And How To Keep It Simple)

By Dale L. Puckett

This is the first installment of a new monthly feature on the powerful OS-9 operating system.

Grab your CoCo and hold on! Thanks to Tandy's release of Microware's OS-9 operating system, you now have more computing power at your fingertips than you ever dreamed possible.

Welcome to KISSable OS-9, a brand new monthly feature in *Rainbow*. First, let's explain the title. Computing is a complex business. Yet, if we keep our wits about us and learn to solve one small problem at a time, we can create large programs that are nothing short of amazing.

Writing is the same. Although it sounds like a snap, it is probably one of the hardest things in the world to do right. However, if you look closely, you'll find the writer's formula for success is similar to the programmer's. He uses short words, short sentences and short paragraphs to build stories that work.

Today's programmers use short modules of readable code to build complex programs. The OS-9 operating system and the high level languages it brings you make the job easy.

Simplicity is the key to success in both professions—unfortunately, it is also highly evasive. Often, it seems impossible to achieve. That's where our title comes in.

KISS is an acronym learned early in a journalism curriculum. It stands for "Keep It Simple, Stupid." Hopefully, every time I wander into a complex maze and start to confuse you—and myself—I'll glance back at the title of the column and force myself back on track.

I've been very excited ever since *the Rainbow* asked me if I would be interested in introducing you to OS-9. I didn't hesitate.

My response was immediate because of my pleasant experiences with OS-9 during the past several years. Let's make a comparison. If you have only used Radio Shack's Disk Extended BASIC in the past, you probably think it's pretty hot stuff. It is! However, if you've already moved up to a real opeating system like FLEX, you probably love it more. In either case, I'm predicting that after you've used OS-9 for a while, you'll think you're in microcomputer heaven.

This column is dedicated to you—the CoCo user. We'll try to show you little tricks that make your computer more powerful and easier to use. And soon, we'll move on to introduce you to powerful new languages like BASIC09, C, and Pascal. We'll also introduce you to the OS-9 assembler and show you how to write your own 6809 machine code modules. Then, since it's always better to show than tell, we'll take a few short Color BASIC programs and rewrite them in BASIC09. Wait till you see the difference!

The arrival of OS-9 has already generated a lot of excitement in the Color Computer arena. Frank Hogg Laboratory, for example, has already announced a new High Resolution Screen and Utility package for the CoCo version of OS-9. It's called O-PAK and will give you a 51 x 24 character screen for around $35.

Frank immediately realized that a state of the art operating system like OS-9 and the powerful applications software it can run would be cheated by the 32-column display on CoCo. He plans to have O-PAK ready by October 1.

Incidentally, you'll love the utilities you get with O-PAK. You'll be able to read FLEX and Radio Shack disks from OS-9. You'll also be able to dump and list them and look at their directories. Powerful OS-9 applications software like the DynaStar text editor, DynaSpell spelling checker and many high level languages will be available for CoCo's OS-9 operating system at some very nice prices.

Our registration fee has been mailed and plane reservations confirmed. We'll be covering the Second Annual OS-9 Seminar in Des Moines for you, August 12—15. We'll even take along the camera so you can see the faces of the people who are bringing you this powerful tool.

OS-9: An Overview

OS-9 has so many things going for it that it will take us several months to show you the major features. In this first column we'll reveal some new magic in CoCo's keyboard as

(Dale L. Puckett is a freelance writer and programmer who has worked with the Motorola family of microprocessors since 1976. He just completed his first book, "A Complete Tour Guide To BASIC09*," this summer. It is being published by Microware and will be available this fall. He is the author of DynaSpell, Readtest, Esther and Help, which are available from Frank Hogg Laboratories. He serves on the InfoWorld Software Review Board and is a Chief Warrant Officer in the U.S. Coast Guard.)*

we show you how to talk to OS-9. We'll even throw in a few tricks that will make your life as a programmer easier. But first, let's answer a few questions in an attempt to get to the bottom line.

Why should you be excited about OS-9? What's an operating system? What are OS-9's advantages over Disk Extended BASIC? Why is it better than FLEX? Is it? To answer these questions we must look at OS-9's family tree.

OS-9 is an extremely efficient implementation of the UNIX operating system philosophy which was designed and coded in 6809 assembly language by Microware Systems Corporation in Des Moines, Iowa. Since it is native 6809 machine code it is small and fast.

UNIX, developed by Bell Laboratories in the early 1970s, was written in "C." Its designers strived to create an operating system that recognized that software development is expensive. It simply took too much time to write and maintain system and application programs. UNIX helped, but was too big to fit on most microprocessors. OS-9 makes the UNIX philosophy work on CoCo and other 6809 microcomputers.

Let's use your Color Computer as an example. How many times have you needed to use one program while you were running another? How many times have you wished that your spouse could use the computer to keep the books while you were programming it from a second terminal? Have you ever wished you could print a long letter while you were composing another? Now, we all do these things easily, every day, with OS-9.

It all started when Motorola, the 6809's manufacturer and Microware Systems Corporation in Des Moines, joined forces to write an operating system designed to use every capability in the chip. The project was possible because the 8-bit 6809 microprocessor has several 16-bit registers and almost every memory addressing mode used by a minicomputer.

Motorola's goal was to sell mass-produced "software-on-silicon"—everything would be distributed in ROM (Read Only Memory) chips. To do this, they needed a set of modules (programs) that could be plugged anywhere in memory.

The use of an assembler to reassemble the source code or a linking loader to link the modules together at "run time" was out of the question. The modules had to be "position independent."

The operating system also needed to meet several other requirements: All modules had to be re-entrant. More than one user would be running them at the same time. This meant that you had to be able to interrupt the routine in the module, let another program execute it and then return to the original caller with all answers intact. It also meant that the programs in the modules could not modify themselves while they were running.

OS-9 Modules must contain only machine code. Variables are stored in a separate data area. This lets you remove modules when they aren't being used and makes room for other programs.

The OS-9 operating system knows which language is being used in a module. And, modules can talk to each other. The streams of characters traveling between modules, files and devices all look alike. An OS-9 program can't tell if it is getting instructions from a keyboard or a disk file. It has no need to know. Individual device drivers are the only modules that need to know—because they take care of all adjustments.

The requirements and characteristics above give you an operating system made up of a number of small modules. Each module contains the following information:

a) A name made up by a string of ASCII characters.
b) A module header that contains the module type and size.
c) A revision number.
d) The distance from the beginning of the module to the beginning of the code.
e) The amount of memory required to execute the module.
f) A checksum that makes sure your program is loaded properly. If the checksum is incorrect, OS-9 will not execute your program.

Major modules in your Color Computer's OS-9 operating system include:

a) OS9 and OS9p2: A kernel which forms the heart of the operating system.
b) Clock: Divides the 6809's time between several different processes by managing interrupts from a 60 cycle power line. This makes the processes appear to be running at the same time and also keeps the time of day.
c) IOMan: Manages all requests for Input/Output from all devices.
d) RBF: Takes care of all Input and Output to random files on floppy disks and other block-oriented devices. It also handles all directories and other file information.
e) SCF: Manages OS-9's communication with your keyboard, CoCo's screen and other devices that read or write one character at a time.
f) CCIO: The device driver that actually communicates with the hardware inside CoCo. It services both the keyboard, and the screen.
g) RS232: The device driver for the RS-232 port. You use it when you timeshare your CoCo with an external terminal.
h) TERM: A device descriptor that contains data used to tell your programs what your terminal looks like. It works with the CCIO device driver.
i) T1: Another device descriptor that tells your programs what they can expect from your external terminal. It uses the RS232 device driver.

How does this newfangled operating system fit into the picture? How does it compare to the Color Disk Extended BASIC you have been using?

Color Disk Extended BASIC is a programming language. It contains a few simple routines that allow you to save programs and data on a floppy disk and load them back in for use. When you talk to it, you use BASIC language. You can tell it to "PRINT HELLO!," etc.

OS-9, on the other hand, is an environment. It makes it possible for BASIC09, Microware's own highly readable and structured advanced BASIC language, and other computer languages to talk to the real world.

OS-9 connects your program to your keyboard. It writes letters and numbers on CoCo's screen so you can read them and prints data on your printer so you can have a hard copy. It saves programs on floppy disks for you—so you won't have to type them over every time you want to run them and it even lets you run two or more programs at the same time—a process called multi-tasking.

OS-9 has its own library of programs that you can call in

to do your dirty work. These programs are called utility programs and we'll be showing you how to use them during the next several months. This month, we'll show you some new magic in CoCo's keyboard.

Special Keys

When you run OS-9, several special keys make life easier. They help you correct mistakes, repeat actions or even stop a program in midstream.

Let's start with the "mistakes." What happens if you mean to type *LIST* but LOST comes out of your fickle fingers? No problem—if you correct it. And if you don't OS-9 will let you know.

There are two ways to correct an error. You can hit the backspace key and back the cursor up to the bad character so you can type over it. Or, you can hit the line delete key to get rid of the whole mess and start over. It's your choice. To do this, you use CoCo's back arrow key.

You say your Color Computer doesn't have a key marked "LINE DELETE"? No problem! Most terminals don't. CoCo's OS-9 lets you delete the line you are typing by striking the "X" while holding down the key marked "CLEAR." In fact, the CLEAR key always serves as the CONTROL key when you are running OS-9.

Other special functions let you repeat the previous input line, interrupt a program, redisplay the present input line, exit a program, or wait. The "wait" function gives you a way to stop CoCo's screen from scrolling so that you may study a line while listing a long file.

The Repeat Key

You'll love the repeat function because of the wear and tear it saves your finger tips. To use it, you hold down the "CLEAR" key while typing the letter "A." You'll find this function really handy when you need to run the same command line several times. Just type CLEAR A and the line will magically reappear. Then, type ENTER to run the command again.

Try this the next time you turn on CoCo. Type: DIR ENTER. You should see a list of the contents of your current data directory.

Then, type: CLEAR A ENTER. Your trusty Color Computer should list the directory again. If you think the repeat key is neat now, wait till you use it with a long command line.

It sure beats typing. Exercise this special key every time you get the chance. You'll save hours.

Other Special Keys

If you ever need to temporarily stop a program in the middle, you can use the Interrupt Key. To do this on your Color Computer, you strike the letter "C" while holding down the CLEAR key. Or, you can strike the BREAK key while holding down the SHIFT key.

You may redisplay the present input line by typing CLEAR D. Or, stop a program by typing BREAK. Or, you could type CLEAR E. The "E" stands for "End." On most other OS-9 computers you type "Control Q" for quit.

Imagine that you are running a program that prints a long list of numbers on your terminal. The numbers are coming at you so fast that they scroll off the screen before you can read them. What do you do?

This would be a good time to try OS-9's special "wait" key. Strike the "W" key while holding down the CLEAR key. The printing should stop. After you have studied the numbers, you may continue printing by hitting any other key. Try it.

The last special key lets you ESCAPE. It sends an end-of-file character and gives you a way to send a signal to procedures that receive data from the keyboard. To send it, hold down the CLEAR key and strike the BREAK key.

There's only one catch. When you send this ESCAPE code to OS-9, you must be sure that you type ESCAPE as the first character on the line.

Other OS-9 Magic

Hold on to your seats, we haven't told you everything. Are you impatient? Do you often know what you want to do next but you find yourself waiting for the computer to finish one task so you can tell it to do the next?

Rest easy. OS-9 lets you "type ahead." This is a fancy way of saying that while CoCo is running one program, you can go ahead and type another command line, or answer the next question if you know what it will be.

In fact, you may stay several command lines in front of CoCo. It will execute them one at a time, just as fast as it can. There are only two gotchas. First, you will be typing blindly. This is only a minor slow-down however, and is much better than sitting around chewing your fingernails. And secondly, you cannot type ahead on CoCo's keyboard while the disk drives are being accessed. Tandy should have used an ACIA for I/O instead of bit banging PIAs.

I hope you have enjoyed this first look at OS-9 on the Color Computer. Next month we'll look at the file system, show you how the directories work and start looking at all of the handy OS-9 utility commands.

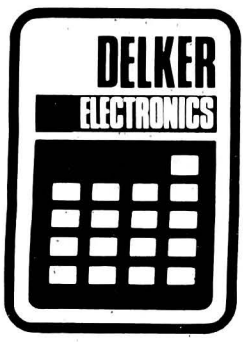
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Create Your Own Tutorial

By Joseph Kolar
Rainbow Contributing Editor

In the last article, we found that when you key in a very long sentence or paragraph which requires more than one program line to complete, and put quotes after the "imaginary line" (the left margin) of the last line of text and follow it with a semicolon, you can continue on the next program line and get neat, satisfactory results.

Given this knowledge, it is good practice to run a tutorial program for your own amusement. The object is to experiment and see if what you are learning holds up in all cases. Also, you want to see if you can find some additional techniques that might be useful.

A good practice, whenever you experiment or revise programs, is to put a fresh tape into your cassette. Many times you will be interrupted or you will get a nice display. If you *CSAVE* twice, you will be able to keep revising and improving your program without the fear of forgetting what you had done before. Later, you can decide to either keep it or erase it. You should keep a specially designated tape handy just for temporary storage.

Personal tutorials are good for the soul! They enable you to make your own programs and give you practice in organizing text. You learn with this "hands on" approach. After you make a nice tutorial, you should *CSAVE* it for your own reference and for your fellow computer addict's benefit.

It is fun to create and you can't help feeling good when you finish and know that not only have you learned something new and enjoyed learning it, but that it is available for future reference and pretty strong evidence that you've come a long way.

It is the old story, "what happens if . . ." Look at the listing.

1) Pose a question.
2) Illustrate it with an example.
3) Determine what happens.
4) If the answer is inconclusive or unsatisfactory, discard it and try another question.
5) If the answer has significance to you, write *REM* statements, giving your conclusions, in your own words that make sense to you.
6) Pose another question to cover a slightly different case. (Go off on a tangent.)
7) Repeat steps 2 to 6.
8) When you have exhausted the possibilities or have gone as far as your interest allows, finish up with a conclusion.

The above instructions are not chiseled in stone. You need not memorize or follow them religiously. They are just a guide to give you the feel of "what if . . ."

Later, you may find other avenues to investigate. You may find your tutorial has a fatal flaw. No sweat! Get out your tutorial and work it up.

Remember, you are making this up for your own benefit and making boo-boos is part of the game. You will agree that it is fun when you discover something new on your own.

Finally, as the proud creator of a tutorial, you may want to share it with others. Submit it to your favorite publication.

Let us consider *REM* statements. If *REMs* are used properly, they are very useful. They can also be distracting and annoying to read if they appear haphazardly in a program.

Did you ever notice a long, explanatory *REM* that has single letters of a word at the right margin and the rest of the word on the next line? Or, a space at the left margin, causing the line to be indented?

Fire up your trusty CoCo and key in this *REM* program line: 10 "NOW IS THE TIME FOR ALL NEWC-OMERS TO TRY TO LEARN AS MUCH AS THEY CAN ABOUT WHAT THEY CAN DO WITH THEIR COLOR COMPUTER." Did you type it in exactly with a space between each word? Good!

Notice that the first line will end with "NEWC." The next line will begin with "OMERS." Your next two lines will have a beginning space at the left margin.

Admit it! It looks like hell and is awkward to read. It need not be!

Recall how we formatted text so that it has a neat appearance and is easily read? The technique for writing neat, readable *REMs* is quite different from formatting text.

Rule 1 is that *REMs* must be formatted on the screen to be read exactly as they are keyed in. What and how you key in is exactly what you see.

Consider that sentence again. Key in: 10 "NOW IS

(Joseph Kolar is a free-lance writer and programmer dedicated to proselytizing for computers in general, and the CoCo specifically.)

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- Accepts 2016, 4016, 6116 static RAM*
- Max capacity of 6 memory chips
- Runs on any size TRS-80 color computer
- Board is jumper addressable to either $C000 or $8000
- Provisions for write protect switch, or can jumper the board to write protect RAM
- Jumpers configure the memory type used on the board. Provisions for inserting DIP switches in place of the jumpers
- Gold plated edge connector
- Each IC or IC socket has decoupling cap installed
- Plastic case is available extra, at $7.50 (pricing is subject to change without notice) (case included in EPACK)

* RAM may not work with series E or later color computers.

MMB **$30.00**

** **UPGRADE** (optional for EPACK or EPG)

2732-25 volt **$15.00**	2732-21 volt **$15.00**
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SMALL MEMORY BOARD (SMB)

- Provision for decoupling capacitors
- Accepts (1) 2732 eprom (4K program)
  (1) 2764 eprom (8K program)
  (1) 2764 eprom (16K program)
- No jumpers need to be set
- Board will fit into standard Radio Shack cartridge cases
- Control Craft cartridge cases available

(Radio Shack is a trademark)

SMB (with Control Craft case) **$15.00**

SMB (board only) **$8.00**

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SMB (board only)	____ @	$ 8.00 =	_____
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Shipping & Handling: # of items ____ x $2.00/item =			_____
TOTAL ORDER:		**$**	_____

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DEALER INQUIRIES WANTED (minimum dealer order is 5 units)

THE TIME FOR ALL NEW." Put "-" after the NEW and continue on the next line: "COMERS TO TRY TO LEARN AS MUCH." There are two spaces left. Press two SPACES. This will bring you to the next line. Key in "AS THEY CAN ABOUT WHAT THEY CAN." This time there is one space. Press SPACE and continue on the next line and finish up.

Now the *REM* looks neat and is easy to read.

Keep in mind that the only time you will see the *REM* is when you *LIST* your program. LIST it!

HINT: If a line of *REM* text ends with a one-letter word like "A" or a variable like "X," you may prefer to put a space in that right margin position and start the letter at the left margin.

There are a few conventions that you can use to make your *REMs* interesting.

When making an ordinary *REM* statement, put three asterisks after " ' ." This spotlights the line.

If you run out of string space (LS ERROR MESSAGE), backspace to the end of a full line. Start a new ' line but leave out the asterisks and continue. This indicates that the line is a continuation of the starred *REM*.

When you want to call attention to a part of the program with a *REM*, try centering it, and fill in the places before and after it with plusses.

If memory allows, you may want to blank out lines above and/or below a *REM* line. Just put in line numbers and " ' " to set off parts of your program.

Notice the treatment in lines 5; 50,60; 130,140; 340, 350,360 of the listing. These are some of the visual effects you might want to create.

All your effort may be in vain if you fail to leave a space between the program line number and the " ' " marker. If you don't leave a space, when you ENTER and *RUN* your program, the computer will automatically put it. Your entire *REM* line will be effectively moved to the right one space. There is no telling what a long *REM* line will look like. The chances are that you will spoil the effect you spent so much time trying to create.

Mike Bryant, Utica, N.Y., suggests putting *REMs* into the listing using lower case. This will create reversed characters and cause them to stand out vividly.

Check out how many bytes are used up when you use *REM* and when you use " ' ."

With formatted text and formatted *REMs* you can create visually pleasing tutorials for yourself. Remember that each investigation; each question pursued; each "what if . . ." explored adds to your knowledge. If you consciously try to follow these hints, you will find that, in time, you will make neat program text and program listings that will be a joy to read.

You may even want to dress up the listing with a title page for practice. Go ahead! Indulge yourself!

```
20 ..... 0201
100 ..... 03C4
190 ..... 064F
310 ..... 0968
395 ..... 0C06
END .....0EC5
```

```
Ø GOTO 5ØØ
1 '***THIS LISTING IS AN EXAMPLE
OF EXPLORING DIFFERENT EXAMPLES
TO TEST WHAT HAPPENS WHEN YOU DO
```


FILMASTR

The Color Computer has a powerful ally in FILMASTR. This is a DATA MANAGEMENT SYSTEM that you can trust. FILMASTR combines the best features of the big systems to provide a combination of speed, power, and ease of operation that can't be beat.

YOU are in complete control of this friendly program with no programming knowledge required. You design the data screen with up to 20 fields by moving the cursor on screen with the arrow keys and typing in the field names. FILMASTR takes care of all of the rest.

Enter data by just filling in the blanks. This form fill-in is easy and natural to use. You can even copy data from the previous record with one key-stroke. Add records, delete records, change records without fuss.

Tell FILMASTR to sort your file on any field that you want or to retrieve a particular file and the job is done with super-human machine language speed. FILMASTR will find a single file or a group of files that meet your request and will save those records as a separate file if you want to.

Controlled printing formats? Of course! Tell FILMASTR which records to use, which fields to print and in what order. You can control the print location to any position on the page. Mailing labels? You bet!

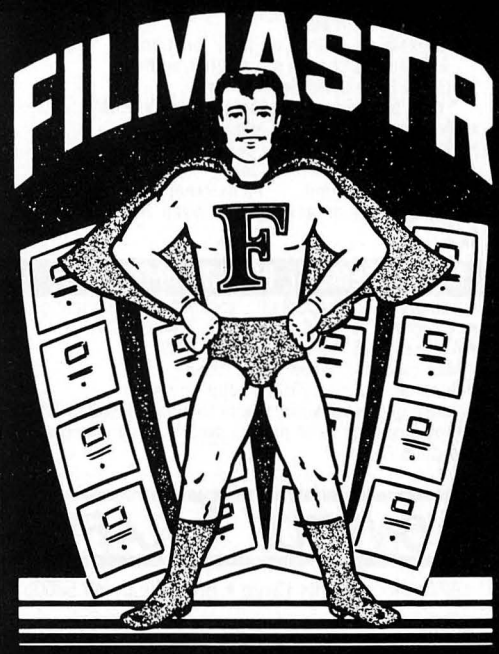
All commands are given to FILMASTR with single keystrokes. Press the HELP key (BREAK), and the available commands are displayed. Make your choice from the menu and let FILMASTR do the work.

FILMASTR can store up to 255 characters in each record and up to 24,000 characters in each file. (9000 with 16K).

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```
DIFFERENT THINGS TO DIFFERENT
CASES OF THE SAME ITEM UNDER
STUDY.
2 '***THIS LISTING ALSO PROVIDES
EXAMPLES OF HOW TO WRITE <REM>'S
SO THEY ARE NEATLY AND LEGIBLY
PRESENTED TO AFFORD EASY READ-
ING.
3 '
5 '********EXAMPLE NO.1********
10 PRINT:PRINT"1 THIS IS A TEST
TO DETERMINE   JUST HOW TO GO AB
OUT MAKING A   SECOND LINE THAT
LINKS UP TO THEFIRST LINE OF AN
EXTRA NUMBER OF";
20 PRINT"LINES.
30 '**** IF THE LINE ENDS JUST
BEFORE THE IMAGINARY LINE, NO
LEAD SPACE IS REQUIRED AFTER THE
IMAGINARY LINE IN THE NEXT PRO-
GRAM LINE.
40 '***YOUR IMAGINARY LINE WILL
BE THE SAME.
50 '
60 '********EXAMPLE NO. 2*******
65 PRINT
70 PRINT"2 WHAT HAPPENS WHEN THE
 END OF  THE WORD DOES NOT COME
UP TO THEEND OF THE IMAGINARY LI
NE?  LET"
80 PRINT"US CHECK IT OUT!  THE I
MAGINARY LINE IS ALWAYS AFTER TH
E 'QUOTE'MARK.
90 PRINT:INPUT"  PRESS <ENTER>";
01
100 CLS:PRINT
110 '***IF THE LINE ENDS ONE
 SPACE BEFORE THE IMAGINARY
LINE, PUT ON THE END <"> AND DO
NOT LEAVE A SPACE AFTER THE IM-
AGINARY LINE ON THE NEXT PROGRAM
LINE.
120 '***THE SAME RESULT CAN BE
 ACHIEVED BY PUTTING THE <">
AFTER THE IMAGINARY LINE AND
FOLLOW WITH A <;>.
130 '
140 '*******EXAMPLE NO. 3*******
150 PRINT"3 WHAT HAPPENS WHEN YO
U DON'T"
160 PRINT"USE THE IMAGINARY LINE
 IN THE   FIRST PROGRAM LINE?
165 PRINT
170 '***SO LONG AS THE FIRST
PROGRAM LINE IS LOGICALLY ENDED,
WITHOUT A BREAK IN SYLLABLES,
YOU CAN USE THE IMAGINARY LINE
IN THE SECOND PROGRAM LINE AS
YOUR NEW IMAGINARY LINE.
180 '******EXAMPLE NO. 4*******
```




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NEW

"THE FROG"

(C) 1983



ARCADE ACTION
This one will give you hours of exciting play... Cross the busy highway to the safety of the median and rest awhile before you set out across thes swollen river teaming with hidden hazards. Outstanding sound and graphics.

16K MACHINE LANGUAGE
$27.95 TAPE
$30.95 DISK

NEW

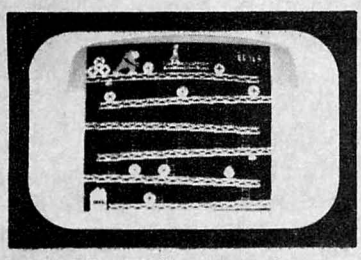


SPACE SHUTTLE

1983
32K Ext. Basic

$28.95 TAPE ONLY

This program gives you the real feeling of flight. Full instrumentation complete to the max. Actual simulation of space flight. **32K Ext. Basic**



THE KING

1982
32K Machine Language
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$29.95 disk

ARCADE ACTION - How high can you climb? Four full graphic screens. Exciting Sound - Realistic graphics. Never before has the color computer seen a game like this. Early reviews say: Just like the arcade - Simply outstanding!

NEW

"TRAPFALL"

By KEN KALISH
(C) 1983



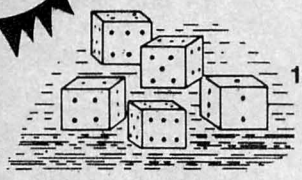
ARCADE ACTION
The "Pitfalls" in this game are many. Hidden treasures, jump over the pits, swing on the vine, watch out for alligators, beware of the scorpion. Another game for the Color Computer with the same high resolution graphics as "The King."

16K MACHINE LANGUAGE
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NEW

"YAAZEE"

(C) 1983



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16K MACHINE LANGUAGE
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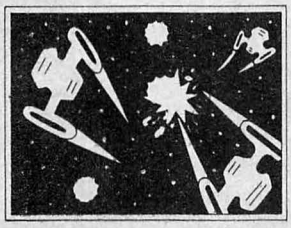
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Wave after wave of enemy fighters drop bombs on your city. Destroy them before they destroy your city. Soon the mother ships appear firing laser blasts at you. Watch for the heat seeking mines.

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THE FIXER-Having trouble moving those 600 Hex progams to disk? The fixer will help. Completely automatic. **$17.95**

TAPE CAT-All new machine language program lists contents of tapes to printer. Make a catalog of your tapes. **$17.95**

PROGRAM PRINTER UTILITY-This program will list basic programs to your printer in two column format. Saves paper and makes your listing look professional. Disk based. **$17.95**

NEW

EDUCATIONAL SOFTWARE For The Color Computer and TDP 100

STORY PROBLEMS is a program that is designed to give practice in solving STORY PROBLEMS (sometimes called STATEMENT, THOUGHT or WORD PROBLEMS) on the COLOR COMPUTER. It is suitable for use in either a home or school environment. It is also a tool that will allow you to create new story problems to suit your children's needs and ability levels. It has many features that make it particularly attractive: Story problems involving addition, subtraction, multiplication, division or a combination of the four are presented to the student by slowly scrolling each letter of each problem onto the screen. Up to 5 students may use the program at the same time. There are 4, user modifiabale, skill levels. 16K Ext. Basic **TAPE $19.95**

CLOCK-With the ever increasing use of digital clocks, more and more young people are unpracticed in the use of the "ANALOG" clocks. You remember those, the ones with the hands. This program will attempt to teach the relationship between the two types of clocks.
REQUIRES 16K EXT. BASIC $14.95

SPELLING TEST is designed to give a standard oral spelling test using the audio track of the computer's tape recorder to dictate test words and sample sentences. Student responses are typed on the keyboard and checked by the computer. Results are displayed on the screen and (if connected) on a printer. **REQUIRES 16K EXT. BASIC $19.95**

MATH DRILL is a program designed to help children to practice addition, subtraction, multiplication, and division skills on the COLOR COMPUTER. It has several features that make its use particularly attractive.
- •Up to 6 students may use the program at the same time.
- •Answers for addition, subtraction and multiplication are entered from right to left, just as they are written on paper.
- •Commas may be included in the answers.
- •Partial products for the multiplication problems may be computed on the screen.
- •Division answers that have a remainder are entered as a whole number followed by the letter "R" and the remainder.
- •There are ten, user modifiable, skill levels.
- •A "SMILEY FACE" is used for motivation and reward. Its size increases relative to the skill level.
- •Skill levels automatically adjust to the student's ability.
- •A timer measures the time used to answer each problem and the total time used for a series of problems.
- •After a problem has been answered incorrectly the correct answer appears under (above in division) the incorrect answer.

REQUIRES 16K EXT BASIC $19.95

WORD DRILL is designed to give a multiple choice vocabulary quiz. Words and definitions are entered into the program from the keyboard or from a tape file. The computer displays a randomly chosen definition and eight word choices. The student must enter his response before a built in timer reaches zero.
REQUIRES 16K EXT. BASIC $19.95

SEARCH-A-WORD This Program generates a word search puzzle to your specifications. You specify the size of the puzzle and the number of words that it is to hide within the puzzle. 16K or 32K Ext. Basic.
TAPE $17.95 **FLEX VERSION $27.95**

EDUCATIONAL PACKAGE — SPELLING TEST — WORD DRILL — MATH DRILL — ESTIMATE — ALL FOR — $69.95

ESTIMATE is a program designed to help children to practice estimating the answers to addition, subtraction, multiplication and division problems on the COLOR COMPUTER. It has many features that make its use particularly attractive:
- •Up to 5 students may use the program at the same time.
- •There are 5, user modifiable, skill levels.
- •The acceptable percent error may be changed as a student's skill improves.
- •A timer measures the number of seconds used to answer each problem and the total time used for a series of problems.
- •If a problem has been answered incorrectly, the student is told the percent error and asked to try again.
- •If a problem is answered incorrectly a second time, the student is told the correct answer and the range of acceptable answers is displayed.
- •A report is given at the end of each set of problems that includes the number of problems done, the number of problems answered correctly on the first try and the average percent error.
- •The (BREAK) key has been disabled so that a child will not inadvertently stop the program from running.

16K EXT. BASIC $19.95

TEACHERS' DATABASE is a program designed to allow a teacher to keep a computerized file of information about his/her students. There are many features that make this program particularly attractive.
- • Information on as many as 100 students (or more) may be in the computer at one time.
- • Each student may have as many as 20 (or more) individual items of data in his/her record.
- • The program will run from cassette or disk.
- • Cassette and disk files are completely compatable.
- • The program is menu driven.
- • Records may be easily changed, deleted, combined or added.
- • Information about students may be numerical or text.
- • Records may be quickly alphabetized.
- • Records may be sorted by various criteria.
- • Records may be reordered (ranked) based on test scores or other data.
- • Data displayed during a sort may be printed on a printer or saved on disk or cassette as a new file.
- • A full statistical analysis of data may be done and sent to the printer.
- • Student test scores may be weighted. **32K EXT BASIC TAPE $39.95 DISC $42.95**

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```
190 '
200 PRINT"4 WHAT TO DO WHEN AN E
XTRAORD-"
210 PRINT"INARY SYLLABLE IS BROK
EN UP?
220 '***IF YOU PUT THE CLOSING
'QUOTE' AFTER THE BROKEN SYLLA-
BLE THE SECOND LINE WILL FOLLOW
AS THE BEGINNING OF A NEW LINE.
225 PRINT
230 '
240 '******EXAMPLE NO, 5*******
250 PRINT"5 THIS IS ANOTHER TEST
 TO DETER-MINE THE VALIDITY OF U
SING THE  SPACE AFTER THE IMAGIN
ARY MARK  TO GIVE CONTINUITY TO
YOUR SYS- ";
260 PRINT"TEM THAT MAY BE USED I
N EVERY   INSTANCE.  THE BEST RU
LE IS ONE THAT HOLDS IN EVERY CA
SE.
270 PRINT:INPUT"  PRESS <ENTER>"
;01
280 CLS:PRINT:PRINT
290 '
300 '*********6 FINAL TEST*******
310 PRINT"6 YOU WILL PLEASANTLY
DISCOVER  THAT AS YOU PROGRESS,
YOU WILL  COMMIT MORE AND MORE T
O MEMORY. REMEMBER, WITH AVAILAB
LE REFER- ENCE MATERIAL, IT IS N
OT WRITTENIN BLOOD, THAT YOU ARE
 REQUIRED TO MEMORIZE EVERYTHING
.  ALL YOU";
320 PRINT"NEED TO KNOW IS WHERE
TO LOOK ITUP.
330 '***IF YOU LEAVE OFF THE <;>
YOU WIND UP WITH AN EMPTY ROW,
ONLY IN THE CASE WHERE THE LAST
LETTER ENDS JUST BEFORE THE IM-
AGINARY LINE.  IT IS NEEDED TO
CLOSE UP THE SENTENCE.
340 '
350 '********CONCLUSION********
360 '
370 '***IT HOLDS IN ALL CASES
THAT IF YOU REACH THE END OF A
MULTIPLE LINE TEXT SENTENCE AND
YOU BACK UP TO THE END OF THE
LAST LOGICALLY POSITIONED LINE,
REGARDLESS OF EXACTLY WHERE IT
ENDS, PROVIDED IT DOESN'T CROSS
380 'THE IMAGINARY LINE, YOU CAN
PUT A <"> AFTER, REPEAT, AFTER,
THE IMAGINARY LINE FOLLOWED BY A
<;> AND YOU ARE IN BUSINESS.
390 '***FOR USE WITH ARTICLE 8A.
395 GOTO 395
500 CLS:FOR I= 1 TO 4:PRINT:NEXT
:PRINT"  THIS PROGRAM EXPLAINS D
IFFER- ENT FACETS OF FORMATTING
TEXT.    REMS ARE USED TO SHOW H
OW THISIS ACHIEVED.
510 PRINT:PRINT"  YOU ARE REQUIR
ED TO READ THE  LISTING FIRST.
WHEN YOU RUN THE PROGRAM, YOU WI
LL SEE THE RE-  SULTANT EXAMPLES
 1 THRU 6.
515 PRINT:PRINT"  REMEMBER TO CO
PY THIS LISTING EXACTLY AS WRITT
EN.
520 PRINT:INPUT"  PRESS <ENTER>"
;01
530 CLS:PRINT:PRINT"  NOTE HOW E
ASY IT IS TO READ   THE LISTING
FROM THE SCREEN!      NOTE HOW D
ISJOINTED THE TEXT  LOOKS ON THE
 LISTING BUT WHEN   YOU <RUN> TH
E PROGRAM, IT LOOKS WELL ORGANIZ
ED.
540 PRINT:PRINT"  THAT IS WHAT W
E WANT TO A-    CHIEVE.  NICE, R
EADABLE TEXT ON THE SCREEN AND N
ICE, READABLE   <REM>S IN THE LI
STING.
550 PRINT:INPUT"  PRESS <ENTER>"
;01
560 PCLS:GOTO 2
```


NEW

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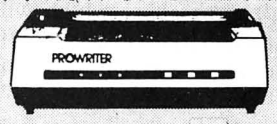
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E

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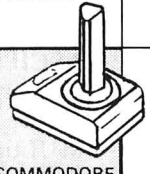
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Down for debugging, text processor's problems cause author to go . . .

Dabbling With Disk

By D. S. Lewandowski
Rainbow Contributing Editor

Well, it seems that a "simple" text processor isn't. I am having a few problems debugging the *EDIT* portion of the program. So in the meantime let's hope the lower prices have encouraged you to purchase a disk system. This month we are going to dabble with disk. Now, I have been playing with the new ROMs. I still haven't gotten my hands on the 1.1 Disk Extended. But from the rumors I've heard, it won't be around long enough to be of any real importance. Yet, we shall access the disk ROM call as recommended in the disk manual. So let's all turn to Page 61 of the disk bible according to Tandy.

Hmmm! It says here that using offset addressing, the location of the DSKCON address is at $C004, with the address of a pointer to the disk variables at $C006. There is even a short assembly language program here which will read Track 3, Sector 17 and store the 255 bytes at $3800. Oh well, not very practical. Let's see if we can modify it to do something.

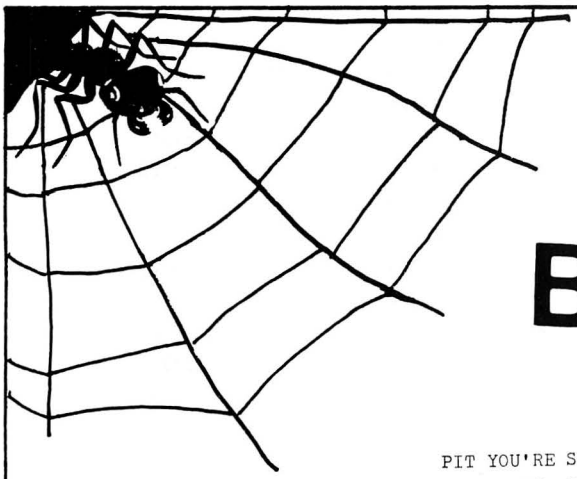
First of all, I like to see if something is happening, so, let's move the buffer to the screen, located at $400. That's nice, now half my screen is pink. (You really have to fill a disk to get information on Track 3, Sector 17.) So, let's reverse those numbers and make it Track 17, Sector 3. That's better, now I see part of the directory track. Now that we know that DSKCON works, let's write a program to allow us to step through the disk and see what it holds. I haven't commented on the listing as I usually do, probably due to the problems with the *EDIT* routine in the text program. So, here is a line by line account of what's happening.

Since we are going to use this program with the disk controller plugged in, we have to ORGinate it at $E00. Start is the now-familiar Clear screen ROM call. Next we need a prompt, or message, to fill the empty screen. So, in line 120 we load the X register with the address of MES. Since we shall be printing more messages, we make *PRINT* a subroutine and branch to it in line 130. The *PRINT* subroutine loads the A register with whatever X is pointing at. Since we pointed X at a line of text labeled MES, we know it's aimed at the right place. Since our MESsage is not very long, we check to see if we have loaded the A register with a zero. If A=0, then our message is over. If A contains anything other than a zero, we jump to a ROM routine which will print the contents of the A register on the screen. Then we branch back to *PRINT* and get the next character that X is pointing to. When the A register finally contains zero, we branch to RET1, which is a return from subroutine. This will bring us back to line 140. Line 140, cleverly enough, branches us around the *PRINT* routine as well as the text.

Okay, we have arrived at line 260. Here we need to get the track and sector inputs from the operator. Now we shall do something I haven't done yet. We are going to get decimal inputs. First, point X at MES1, which is the word TRACK. Then, you guessed it, back to *PRINT*. We know that our disk drive has 35 tracks, numbered 0 to 34. So, let's get a decimal input between 00 and 34—this will make error checking easier. Since we need two keypresses, we branch to GETWO, line 410, from line 280. In GETWO we get a keypress and compare it against $30 on an ASCII zero. If it's less than zero it's no good, so back to GETWO. If it's greater than ASCII 3 or $44, we also go back. Since the A register already contains the ASCII value of the keypress we jump to the ROM call which prints it, echoing the keypress on the screen. If you lost track, we're at line 470. Strip off the ASCII by subtracting $30. Now here's a cute trick, the A register contains the absolute value of the keypress. In line 480 we load the B register with $0A. Next, in line 490 we MULtiply the contents of A with the contents of B. (Remember $0A = 10 Decimal.) The B register now contains either 0, 10, 20, or 30 Decimal, depending on the previous contents of A. Let's put that somewhere safe. Line 500 stores the contents of B at a memory location named VAR. Back to pressing keys, we repeat the same procedure, except that now we will accept a number from zero to nine. In 580 we add the contents of A to the contents of VAR and get our track number. At line 600 we finally return to line 290. Here we load A with $0D, a carriage return, and print it. Next, we load X with the position of MES2, print the prompt, and get the sector number. QUESTION? What is to stop someone from requesting sector 39? ANSWER: Nothing, just don't do that.

Moving right along we come to line 380. Again, we branch

(Dennis Lewandowski, one of the early authors active with the Color Computer, specializes in machine language programming. He and his wife, Rose, founded DSL Computer Products.)



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around our subroutines and end up at MAIN, line 610. Here we have something to see—the track and sector we input is loaded into the proper memory locations using the address contained at $C006. To accomplish this, we load the X register, with the contents of $C006 and $C007 (remember X is a 16-bit register). Loading A with 2 and storing it in the memory location X is pointing at tells DSKCON we wish to READ data. Then using offset addressing, we clear, or zero the memory location X which is pointing at +1. Sounds confusing? Wait and see how far we are going to carry this. Now we load A with VAR1, and store the track number at the memory location X which is pointing at +2. Line 650 loads A with the sector number and stores it at X+3. Since the U stack pointer is idle, we load it with the screen start address and store it at? Right, X+4. Now that all the pointers are in place we jump to the DSKCON routine in line 710. Since DSKCON leaves the drive on, we must turn it off by putting a zero in A and storing it at $FF40.

It would be helpful knowing which TRACK and SECTOR we are on. Since a sector equals 255 bytes, or $FF, we know that $400 to $4FF will be occupied. However, we still have half a screen left. Let's move the cursor down one line, for neatness, and print the word TRACK. We already have TRACK as MES2, so we shall reuse it. We are on line 800 now. BASIC does a lot of things. One is that it constantly is converting hex to decimal. The way this is accomplished is by placing a hex number into the D register. Then after complimenting, ANDing, and ORing, it comes out decimal because the D register is really a combination of A and B, and the numbers we are working with will be no greater than 34 decimal. In line 800 we zero the Z register, which is the first half of the D register. Then we jump to a ROM routine by loading B with the track number stored in VAR1. This routine will convert the hex number in B to decimal, as well as printing it on the screen. Lines 830 to 890 do the same with the sector number.

Now for a command loop. We want to go forward and backward on the disk. For these functions we shall use the + (PLUS) and - (MINUS) keys. We may also wish to restart our program, using the X key for this. To save a sector in a buffer other than the screen, we shall use S, and we shall use W to write that sector. W should also stand for *warning*, since you can really spoil a disk by writing over system information.

Well, everything else seems fairly self-explanatory. So, back to work on the *TEXT* program. See you next month.

```
0E00                00100          ORG     $E00
0E00 BD   A928      00110 START    JSR     $A928
0E03 8E   0E14      00120          LDX     #MES
0E06 8D   02        00130          BSR     PRINT
0E08 20   2A        00140          BRA     CONT
0E0A A6   80        00150 PRINT    LDA     ,X+
0E0C 27   05        00160          BEQ     RET1
0E0E BD   A30A      00170          JSR     $A30A
0E11 20   F7        00180          BRA     PRINT
0E13 39             00190 RET1     RTS
0E14      09        00200 MES      FCC     /       disk read/
0E23      0D00      00210          FDB     $0D00
0E25      54        00220 MES1     FCC     /TRACK /
0E2B      00        00230          FCB     0
0E2C      53        00240 MES2     FCC     /SECTOR /
0E33      00        00250          FCB     0
0E34 8E   0E25      00260 CONT     LDX     #MES1
0E37 8D   D1        00270          BSR     PRINT
0E39 8D   1B        00280          BSR     GETWO
0E3B 86   0D        00290          LDA     #$0D
0E3D BD   A30A      00300          JSR     $A30A
0E40 B6   0E54      00310          LDA     VAR
0E43 B7   0E55      00320          STA     VAR1
0E46 8E   0E2C      00330          LDX     #MES2
0E49 8D   BF        00340          BSR     PRINT
0E4B 8D   09        00350          BSR     GETWO
0E4D 86   0D        00360          LDA     #$0D
0E4F BD   A30A      00370          JSR     $A30A
0E52 20   2F        00380          BRA     MAIN
0E54      00        00390 VAR      FCB     0
0E55      00        00400 VAR1     FCB     0
0E56 BD   A1B1      00410 GETWO    JSR     $A1B1
0E59 81   30        00420          CMPA    #$30
0E5B 25   F9        00430          BLO     GETWO
0E5D 81   33        00440          CMPA    #$33
0E5F 2E   F5        00450          BGT     GETWO
0E61 BD   A30A      00460          JSR     $A30A
0E64 80   30        00470          SUBA    #$30
0E66 C6   0A        00480          LDB     #$0A
0E68 3D             00490          MUL
0E69 F7   0E54      00500          STB     VAR
0E6C BD   A1B1      00510          JSR     $A1B1
0E6F 81   30        00520          CMPA    #$30
0E71 25   E3        00530          BLO     GETWO
0E73 81   39        00540          CMPA    #$39
0E75 2E   DF        00550          BGT     GETWO
0E77 BD   A30A      00560          JSR     $A30A
0E7A 80   30        00570          SUBA    #$30
0E7C BB   0E54      00580          ADDA    VAR
0E7F B7   0E54      00590          STA     VAR
0E82 39             00600          RTS
0E83 BE   C006      00610 MAIN     LDX     $C006
0E86 86   02        00620          LDA     #2
0E88 A7   84        00630          STA     ,X
0E8A 6F   01        00640          CLR     1,X
0E8C B6   0E55      00650          LDA     VAR1
0E8F A7   02        00660          STA     2,X
0E91 B6   0E54      00670          LDA     VAR
0E94 A7   03        00680          STA     3,X
0E96 CE   0400      00690          LDU     #$400
0E99 EF   04        00700          STU     4,X
0E9B AD   9F C004   00710          JSR     [$C004]
0E9F 4F             00720          CLRA
0EA0 B7   FF40      00730          STA     $FF40
0EA3 86   60        00740          LDA     #$60
0EA5 B7   053E      00750          STA     $53E
0EA8 8E   0522      00760          LDX     #$522
0EAB 9F   88        00770          STX     $88
0EAD 8E   0E25      00780          LDX     #MES1
0EB0 BD   0E0A      00790          JSR     PRINT
0EB3 4F             00800          CLRA
0EB4 F6   0E55      00810          LDB     VAR1
0EB7 BD   BDCC      00820          JSR     $BDCC
0EBA 8E   0536      00830          LDX     #$536
0EBD 9F   88        00840          STX     $88
```

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```
0EBF 8E   0E2C     00850          LDX    #MES2
0EC2 BD   0E0A     00860          JSR    PRINT
0EC5 4F            00870          CLRA
0EC6 F6   0E54     00880          LDB    VAR
0EC9 BD   BDCC     00890          JSR    $BDCC
0ECC BD   A1C1     00900 LOOP     JSR    $A1C1
0ECF 81   3B       00910          CMPA   #$3B
0ED1 27   14       00920          BEQ    NEXT
0ED3 81   2D       00930          CMPA   #$2D
0ED5 27   30       00940          BEQ    MINUS
0ED7 81   53       00950          CMPA   #$53
0ED9 27   47       00960          BEQ    SAVE
0EDB 81   57       00970          CMPA   #$57
0EDD 27   54       00980          BEQ    WRITE
0EDF 81   58       00990          CMPA   #$58
0EE1 1027 FF1B     01000          LBEQ   START
0EE5 20   E5       01010          BRA    LOOP
0EE7 B6   0E54     01020 NEXT     LDA    VAR
0EEA 4C            01030          INCA
0EEB 81   13       01040          CMPA   #$13
0EED 27   05       01050          BEQ    CLR
0EEF B7   0E54     01060          STA    VAR
0EF2 20   8F       01070 RET      BRA    MAIN
0EF4 7F   0E54     01080 CLR      CLR    VAR
0EF7 7C   0E54     01090          INC    VAR
0EFA B6   0E55     01100          LDA    VAR1
0EFD 4C            01110          INCA
0EFE 81   23       01120          CMPA   #$23
0F00 27   81       01130          BEQ    MAIN
0F02 B7   0E55     01140          STA    VAR1
0F05 20   EB       01150          BRA    RET
0F07 B6   0E54     01160 MINUS    LDA    VAR
0F0A 4A            01170          DECA
0F0B 27   05       01180          BEQ    STEP
0F0D B7   0E54     01190          STA    VAR
0F10 20   E0       01200          BRA    RET
0F12 86   12       01210 STEP     LDA    #$12
0F14 B7   0E54     01220          STA    VAR
0F17 B6   0E55     01230          LDA    VAR1
0F1A 27   D6       01240          BEQ    RET
0F1C 4A            01250          DECA
0F1D B7   0E55     01260          STA    VAR1
0F20 20   D0       01270          BRA    RET
0F22 BE   C006     01280 SAVE     LDX    $C006
0F25 CE   0F45     01290          LDU    #BUFF
0F28 EF   04       01300          STU    4,X
0F2A AD   9F C004  01310          JSR    [$C004]
0F2E 7F   FF40     01320          CLR    $FF40
0F31 20   BF       01330          BRA    RET
0F33 BE   C006     01340 WRITE    LDX    $C006
0F36 86   03       01350          LDA    #3
0F38 A7   84       01360          STA    ,X
0F3A CE   0F45     01370          LDU    #BUFF
0F3D EF   04       01380          STU    4,X
0F3F AD   9F C004  01390          JSR    [$C004]
0F43 20   AD       01400          BRA    RET
0F45              01410 BUFF     *
          0E00     01420          END    START
00000 TOTAL ERRORS
```

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Opening CoCo's Library To The MC-10

By Dan Downard
Rainbow Technical Editor

A machine language program to convert Color BASIC to MC-10 BASIC

I think in the months to come we will see accelerated interest in the Model MC-10. The availability of software is on the horizon. Radio Shack has introduced a few programs for the PoCo, but the real advantage lies in MicroColor BASIC. Since it's nearly identical to Color BASIC why not take advantage of existing software? For those of you who have already tried loading your CoCo programs into the PoCo, you probably noticed that the tapes loaded correctly but, when you listed the program, all you got was garbage.

How come? The BASIC tokens are different. A token is an abbreviation of a BASIC command, or function, used to save memory and speed program execution. If we could find a way to convert these tokens, CoCo programs written in Non-Extended BASIC could be run on the PoCo. Besides the advantage of existing software, it may be easier to input a program on the CoCo due to the editing commands not present on the other system. Extended and Disk commands are not available with the exception of a few math functions. The program listing that follows contains a machine language listing that not only converts the tokens, but flags the commands that are not available.

Tokens

BASIC converts every command or function input from the keyboard into a one- or two-byte "token" before storing the line into memory. This is done by the ROMs, and invisible to the user. For example, the Color BASIC token for *PRINT* is $87. If you would examine a BASIC program in memory, you would see the hex byte $87 at every location where a *PRINT* command was input. At the same time, when you list a program you see the original command. This is because the ROM also detokenizes the line before outputting it to the screen or, if an ASCII save is requested, to the storage device such as a tape recorder.

Tokenizing is done to preserve memory. Obviously, the one hex byte $87 occupies four less bytes than *PRINT*. Also, program execution is faster. Before every command is executed, BASIC has to compare the command in question to a table of all the commands and find a match. When the match is found, another table is used to find the execution address for that routine. Again, matching just one byte is less time consuming than a table of several bytes each. Actually, the process we have just described is the same method we will use to convert tokens. It is called a "lookup table." Lookup tables are used extensively for code conversion.

Tokens are easy to spot in a hex-dump of a program. They all have bit 7 set, or they are all greater than $80. Since no other ASCII characters greater than $7F represent standard printable characters, you would not expect to find numbers this high in a listing. By this method, BASIC picks out the tokens when scanning a line for execution.

The Program In Memory

The only other thing we need to know to convert programs is where the program is located in memory. This, too, is not as hard as it sounds. If you have been reading the articles about memory maps, you may have noticed an address $0019 (25). The two bytes, or word, at this address tell us where the BASIC program begins. It makes no difference if you are using Non-Extended, Extended or Disk BASIC. If we start at this location in memory, the first two bytes will be the address of the next line, the next two will be the line number, and the remaining bytes will be the program line until a zero is encountered. A zero signifies the end of a line. With a monitor such as RAINBUG, HUMBUG or *ZBUG*, look through a program sometime, it's interesting.

We must use this information to convert our tokens. After ignoring the first four bytes of a line, we can scan for tokens by testing the byte for a minus. This means bit 7 is set. After encountering a token we use a lookup table to convert from CoCo to PoCo. For example, addresses $3000 to $303B correspond to CoCo tokens $80 through $BB. If we look at the corresponding FCB byte, we will find the PoCo token. After converting the token we simply store the new one at the same location as the old one. In the CoCo, functions tokens are preceded by $FF. The succeeding byte is the actual token. For these values, we convert the tokens and store a $20, or a space, in place of the $FF as the PoCo does not have any two-byte tokens.

The only exceptions to this rule are *GOTO* and *GOSUB*. The CoCo recognizes these two tokens as GO-TO and GO-SUB. After finding a $81, or the token for GO, we must

---

(Dan Downard is an electrical engineer and has been involved in electronics for 24 years through ham radio (K4KWT). His interest in computers began about five years ago and he has built several 68XX systems.)

examine the next byte to reveal the true command.

An error reporting routine is called when a token is not convertible, such as *DRAW* or *PMODE*. An "!" is substituted for the command much like in the BASIC ROM routine.

Running MC-10 CONV

As you can see, I used the new *Microware OS-9 Assembler* to produce the object code for this program. It was a good exercise in becoming familiar with the new operating system. This particular program is so short it would probably be faster just to key in the machine code using a monitor rather than assembling a file. Once the program is in memory, save it using:

(C)SAVEM"MC10",&H3000,&H30CC,&H305 C

If you are using *EDTASM+* be careful with the FCBs; every one must be entered on a separate line. Also delete Line 1, as *EDTASM+* will not support the NAM directive. After these two changes the rest of the text can be entered as it is shown.

The program is written in position independent code and will execute anywhere in memory depending on your system. To convert a program, use the following steps:

1) Load the CoCo BASIC program. You may list it but do not run it.
2) *(C)LOADM*"MC10"
3) *EXEC*
4) After the OK prompt save the BASIC program to tape using *CSAVE*"FILENAME"
5) Load the tape into your PoCo using *CLOAD*.

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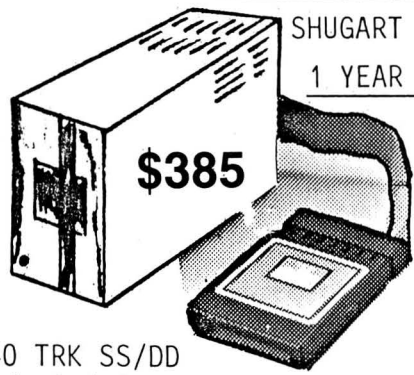
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6) List the program and notice any "!" symbols. If there are none, you're OK.

If you find a "!" in your program, you will have to list the original program and do the best you can to convert the command to an equivalent that will be accepted by the MC-10. One good example is *ELSE*. For example . . . *ELSE* N=10 can usually be rewritten as . . . :N=10. Watch out for

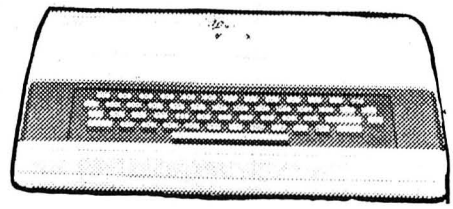
FUNCTION	COCO TOKEN	MC-10 TOKEN	COMMAND	COCO TOKEN	MC-10 TOKEN			
SGN	FF80	B1	FOR	80	80	LLIST	9B	99
INT	FF81	B2	GOTO	81 A5	81	SET	9C	9B
ABS	FF82	B3	GOSUB	81 A6	82	RESET	9D	9C
USR	FF83	B4	REM	82	83	CLS	9E	9D
RND	FF84	B5	IF	85	84	SOUND	A0	9E
SIN	FF85	B9	DATA	86	85	EXEC	A2	9F
PEEK	FF86	BC	PRINT	87	86	SKIPF	A3	A0
LEN	FF87	BD	ON	88	87	TAB(	A4	A1
STR$	FF88	BE	INPUT	89	88	TO	A5	A2
VAL	FF89	BF	END	8A	89	THEN	A7	A3
ASC	FF8A	C0	NEXT	8B	8A	NOT	A8	A4
CHR$	FF8B	C1	DIM	8C	8B	STEP	A9	A5
LEFT$	FF8E	C2	READ	8D	8C	OFF	AA	A6
RIGHT$	FF8F	C3	RUN	8E	8E	+	AB	A7
MID$	FF90	C4	RESTORE	8F	8F	—	AC	A8
POINT	FF91	C5	RETURN	90	90	*	AD	A9
INKEY$	FF92	C7	STOP	91	91	/	AE	AA
MEM	FF93	C8	POKE	92	92	↑	AF	AB
COS	FF95	BA	CONT	93	93	AND	B0	AC
TAN	FF96	BB	LIST	94	94	OR	B1	AD
EXP	FF97	B8	CLEAR	95	95	>	B2	AE
LOG	FF99	B7	NEW	96	96	=	B3	AF
SQR	FF9B	B6	CLOAD	97	97	<	B4	B0
VARPTR	FF9D	C6	CSAVE	98	98	LET	BA	8D



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PRINT#-2 commands. They will have to be changed to *LPRINT*.

Summary

I tested the program on two of the examples in the back of the "Getting Started" book and they worked fine. The first program was *Blackjack*, on page 292. It had an *ELSE* statement in Line 4020 that required a colon instead of the *ELSE*. The other program was *Play Back Your Tune*, on page 294. No modifications were necessary at all after using "MC10." These were two good examples, as the first program had graphics and the second used *SOUND* for some music.

There's a wealth of software already written for the MC-10. Just find someone with a Color Computer.

The listing:

```
Microware OS-9 Assembler RS Version 01.00.00    07/27/83 19:12:21     Page 001
MC10CONV -

00001                           NAM   MC10CONV
00002          *DAN DOWNARD REV0
00003          *PROGRAM TO CONVERT
00004          *COCO TOKENS TO MC-10
00005  3000                     ORG   $3000
00006  3000 80008300   TABLE1   FCB   $80,0,$83,0
00007  3004 00848586            FCB   0,$84,$85,$86
00008  3008 87888980            FCB   $87,$88,$89,$8A
00009  300C 8B8C8E8F            FCB   $8B,$8C,$8E,$8F
00010  3010 90919293            FCB   $90,$91,$92,$93
00011  3014 94959697            FCB   $94,$95,$96,$97
00012  3018 98000099            FCB   $98,0,0,$99
00013  301C 9B9C9D00            FCB   $9B,$9C,$9D,0
00014  3020 9E009FA0            FCB   $9E,0,$9F,$A0
00015  3024 A1A200A3            FCB   $A1,$A2,0,$A3
00016  3028 A4A5A6A7            FCB   $A4,$A5,$A6,$A7
00017  302C A8A9AAAB            FCB   $A8,$A9,$AA,$AB
00018  3030 ACADAEAF            FCB   $AC,$AD,$AE,$AF
00019  3034 B0000000            FCB   $B0,0,0,0
00020  3038 00008D00            FCB   0,0,$8D,0
00021  303C B1B2B3B4   TABLE2    FCB   $B1,$B2,$B3,$B4
00022  3040 B5B9BCBD            FCB   $B5,$B9,$BC,$BD
00023  3044 BEBFC0C1            FCB   $BE,$BF,$C0,$C1
00024  3048 0000C2C3            FCB   0,0,$C2,$C3
00025  304C C4C5C7C8            FCB   $C4,$C5,$C7,$C8
00026  3050 00BABBB8            FCB   0,$BA,$BB,$B8
00027  3054 00B700B6            FCB   0,$B7,0,$B6
00028  3058 00C60000            FCB   0,$C6,0,0
00029  305C DE19       START    LDU   <$19        START OF PROGRAM
00030  305E 2004                BRA   START1      SKIP OVER NEW LINE
00031  3060 EEC4       NEWLIN   LDU   ,U          START OF NEXT LINE
00032  3062 2746                BEQ   QUT         FINISHED
00033  3064 3142       START1   LEAY  2,U         Y=LINE NUMBER
00034  3066 3044                LEAX  4,U         X=FIRST BYTE OF LINE
00035  3068 A680       LOOP     LDA   ,X+         LOAD BYTE & INC X
00036  306A 2B04                BMI   TOKEN       BIT 7 INDICATES TOKEN
00037  306C 27F2                BEQ   NEWLIN      0 MEANS END OF LINE
00038  306E 20F8                BRA   LOOP        GET ANOTHER BYTE
00039  3070 81FF       TOKEN    CMPA  #$FF        IS IT A FUNCTION?
00040  3072 261C                BNE   CONVERT     IF NOT BRANCH
00041  3074 C620                LDB   #$20        SUB SPACE FOR $FF
00042  3076 E71F                STB   -1,X        STORE IT
00043  3078 A680                LDA   ,X+         GET REAL TOKEN
00044  307A 81A0                CMPA  #$A0        CAN WE CONVERT?
00045  307C 2C2F                BGE   NOGOOD      IF NOT PRINT
00046  307E B47F                ANDA  #$7F        STRIP BIT 7
00047  3080 3410                PSHS  X           SAVE X REG
00048  3082 308DFFB6            LEAX  TABLE2,PCR  LOOKUP TABLE 2
00049  3086 A686                LDA   A,X         CONVERT BYTE
00050  3088 2721                BEQ   NO1         CAN NOT CONVERT
00051  308A 3510                PULS  X           RESTORE X REG
00052  308C A71F                STA   -1,X        STORE NEW TOKEN
00053  308E 20D8                BRA   LOOP        GET ANOTHER BYTE
00054  3090 81BC       CONVERT  CMPA  #$BC        CAN WE CONVERT?
00055  3092 2C19                BGE   NOGOOD      IF NOT PRINT
00056  3094 8181                CMPA  #$81        IS IT GOTO OR GOSUB?
00057  3096 271B                BEQ   GOTO        IF YES BRANCH
```


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```
00058  3098 B47F          ANDA  #$7F       STRIP BIT 7
00059  309A 3410          PSHS  X          SAVE X REG
00060  309C 308DFF60      LEAX  TABLE1,PCR LOOKUP TABLE 1
00061  30A0 A686          LDA   A,X        LOOK UP TOKEN
00062  30A2 2707          BEQ   NO1        CAN NOT CONVERT
00063  30A4 3510          PULS  X          RESTORE X REG
00064  30A6 A71F          STA   -1,X       STORE NEW TOKEN
00065  30A8 20BE          BRA   LOOP       GET ANOTHER BYTE
00066  30AA 39       OUT  RTS              RETURN TO BASIC
00067  30AB 3510     NO1  PULS  X          RESTORE X REG
00068  30AD 8621     NOGOOD LDA  #'!       !=NO CONVERT MARKER
00069  30AF A71F          STA   -1,X       STORE IN PLACE OF TOKEN
00070  30B1 20B5          BRA   LOOP       GET ANOTHER BYTE
00071  30B3 A680     GOTO LDA   ,X+        GET REAL TOKEN
00072  30B5 81A5          CMPA  #$A5       IS IT GOTO?
00073  30B7 2606          BNE   GOSUB      IF NOT BRANCH
00074  30B9 8681          LDA   #$81       TOKEN FOR GOTO
00075  30BB A71E          STA   -2,X       STORE TOKEN
00076  30BD 2008          BRA   BACK       RETURN TO LOOP
00077  30BF 81A6     GOSUB CMPA  #$A6       IS IT GOSUB?
00078  30C1 26EA          BNE   NOGOOD     CAN NOT CONVERT
00079  30C3 8682          LDA   #$82       TOKEN FOR GOSUB
00080  30C5 A71E          STA   -2,X       STORE TOKEN
00081  30C7 8620     BACK LDA   #$20       STORE SPACE IN
00082  30C9 A71F          STA   -1,X       BYTE ONE
00083  30CB 209B          BRA   LOOP       GET ANOTHER BYTE
00084                      END

00000 error(s)
00000 warning(s)
$00CD 00205 program bytes generated
$0000 00000 data bytes allocated
$0106 00262 bytes used for symbols

30C7 L BACK    3090 L CONVERT 30BF L GOSUB   30B3 L GOTO    3068 L LOOP
3060 L NEWLIN  30AB L NO1     30AD L NOGOOD  30AA L OUT     305C L START
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```

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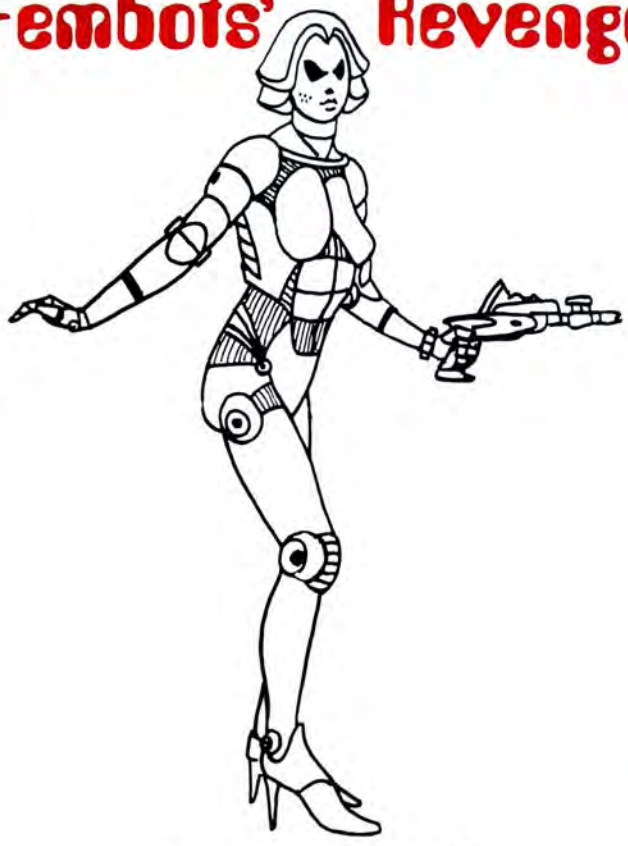
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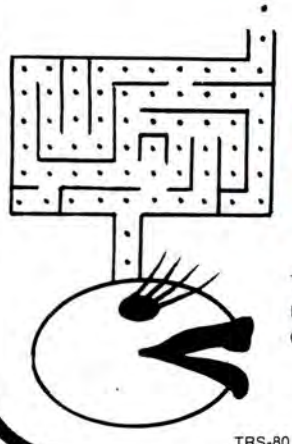


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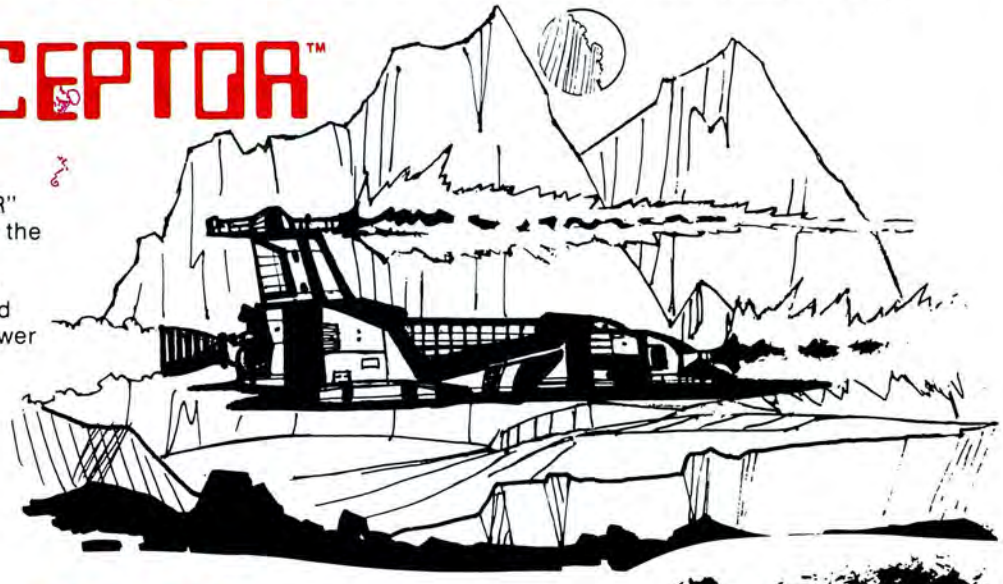
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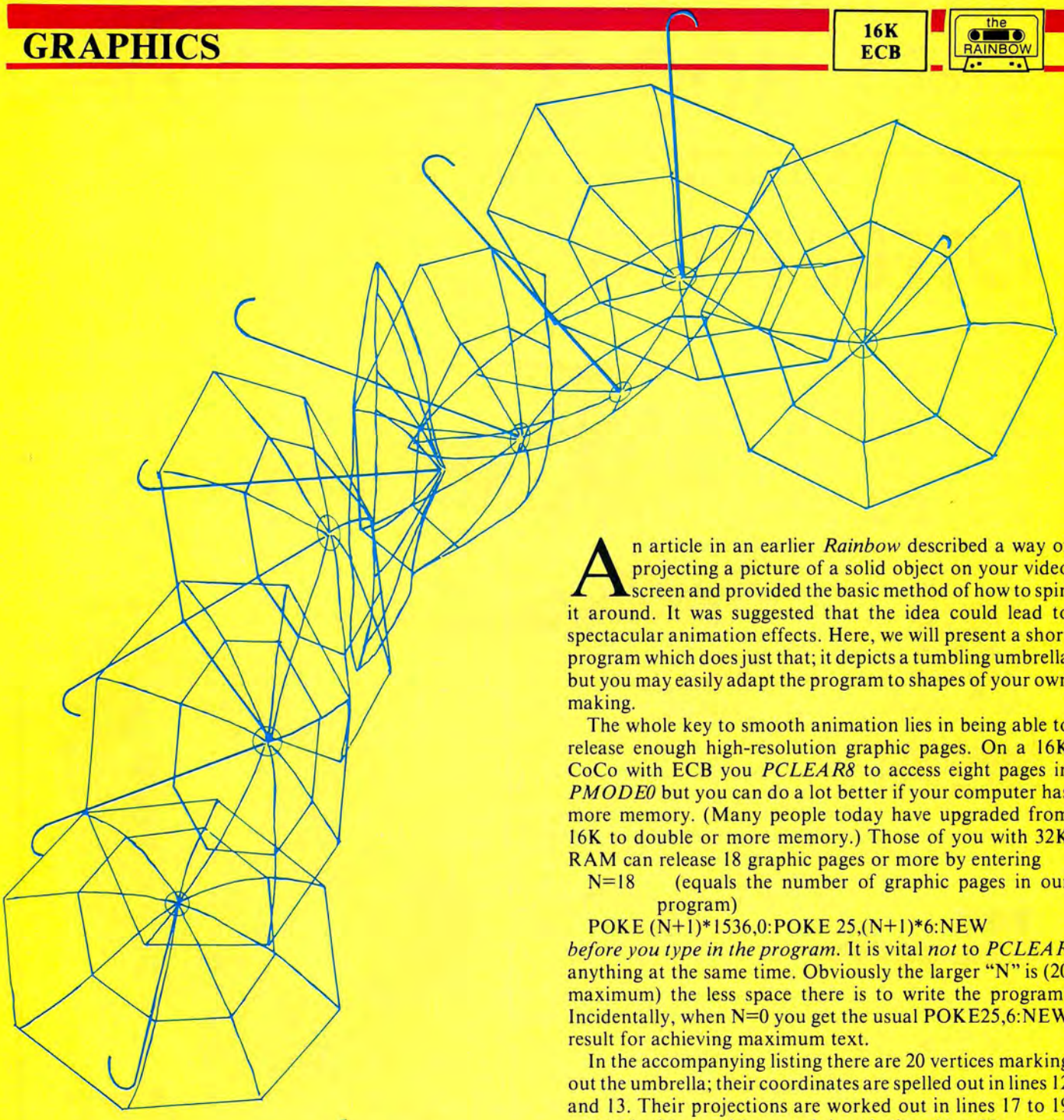
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Tumble Brella

By Bob Delbourgo and Brian Ferguson

An article in an earlier *Rainbow* described a way of projecting a picture of a solid object on your video screen and provided the basic method of how to spin it around. It was suggested that the idea could lead to spectacular animation effects. Here, we will present a short program which does just that; it depicts a tumbling umbrella but you may easily adapt the program to shapes of your own making.

The whole key to smooth animation lies in being able to release enough high-resolution graphic pages. On a 16K CoCo with ECB you *PCLEAR8* to access eight pages in *PMODE0* but you can do a lot better if your computer has more memory. (Many people today have upgraded from 16K to double or more memory.) Those of you with 32K RAM can release 18 graphic pages or more by entering

N=18 (equals the number of graphic pages in our program)

POKE (N+1)*1536,0:POKE 25,(N+1)*6:NEW

before you type in the program. It is vital *not* to *PCLEAR* anything at the same time. Obviously the larger "N" is (20 maximum) the less space there is to write the program! Incidentally, when N=0 you get the usual POKE25,6:NEW result for achieving maximum text.

In the accompanying listing there are 20 vertices marking out the umbrella; their coordinates are spelled out in lines 12 and 13. Their projections are worked out in lines 17 to 19 and their video positions are joined in lines 20 to 22 to make the umbrella shape. Suffice it to say that M stands for the graphic page number and, correspondingly, line 23 increases the rotation angle T by 20 degrees with each successive picture. The rest is self-explanatory.

```
8 ..... 0244
15 ..... 040C
END..... 0608
```

The listing:

```
1 CLS2:PRINT@37,"THE TUMBLING UM
BRELLA";:
2 PRINT@101,"AN ANIMATION PROBRA
M ";:PRINT@133,"WITH 18 GRAPHIC
PAGES";
3 PRINT@193,"BY r.delbourgo and
```

```
b.ferguson";:PRINT@225,"hobart,t
asmania,australia7005";
4 PLAY"O3L8CL4O4CO3L12AGFL6DP12L
8CL4FL12FGAO4L4C"
5 PRINT@352,"you will be asked t
o choose the polar angle (or lat
itude) and   the azimuth (or lon
gitude) of   the rotation axis."
6 PLAY"O3L8CL4FL12GAO4L4CO3L8AP1
2004CL4CL12O3AGL4D"
7 PI=3.141592653:DIMX(20),Y(20),
Z(20),NR(20),P(20),Q(20),PG(24)
8 CLS:PRINT@2,"** THE TUMBLING U
MBRELLA **":PRINT:INPUT"POLAR AN
GLE (IN DEGREES)";B:B=B*PI/180:C
B=COS(B):SB=SIN(B)
9 INPUT"AZIMUTH (IN DEGREES)";A:
A=A*PI/180:CA=COS(A):SA=SIN(A)
10 T=15*PI/180:PRINT@417,"PRESS
<R> AFTER ANIMATION IF":PRINT@44
9,"YOU WANT TO CHANGE ORIENTATIO
N";
11 NX=SB*CA:NY=SB*SA:NZ=CB
12 FORU=1TO8:X(U)=40*COS(U*PI/4)
:Y(U)=40*SIN(U*PI/4):Z(U)=40:X(U
+8)=7*X(U)/4:Y(U+8)=7*Y(U)/4:Z(U
+8)=20:NEXTU
13 X(17)=0:Y(17)=0:Z(17)=50:X(18
)=0:Y(18)=0:Z(18)=-60:X(19)=0:Y(
19)=10:Z(19)=-70:X(20)=0:Y(20)=2
0:Z(20)=-60
14 FORI=1TO20:NR(I)=NX*X(I)+NY*Y
(I)+NZ*Z(I):NEXTI
15 FORM=18TO1STEP-1:GOSUB26
16 PMODE0,M:COLOR0,1:PCLS:SCREEN
1,0
17 FORI=1TO20:P(I)=128+X(I)*CT-N
R(I)*(CT-1)*NX-(NY*Z(I)-NZ*Y(I))
*ST
18 Q(I)=96+Y(I)*CT-NR(I)*(CT-1)*
NY-(NZ*X(I)-NX*Z(I))*ST
19 NEXTI
20 FORU=1TO8:LINE(P(U),Q(U))-(P(
U+1-8*INT(U/8)),Q(U+1-8*INT(U/8)
)),PSET:LINE(P(U+8),Q(U+8))-(P(U
+9-8*INT(U/8)),Q(U+9-8*INT(U/8))
),PSET:NEXTU
21 FORU=1TO8:LINE(P(U),Q(U))-(P(
U+8),Q(U+8)),PSET:LINE-(P(17),Q(
17)),PSET:NEXTU
22 LINE(P(17),Q(17))-(P(18),Q(18
)),PSET:LINE-(P(19),Q(19)),PSET:
LINE-(P(20),Q(20)),PSET
23 T=T+PI/10:NEXTM
24 FORM=18TO1STEP-1:PMODE0,M:SCR
EEN1,1:FORT=1TO15
25 IFINKEY$<>"R"THEN NEXTT,M:GOT
O24 ELSERUN7
26 CT=COS(T):ST=SIN(T):RETURN
```


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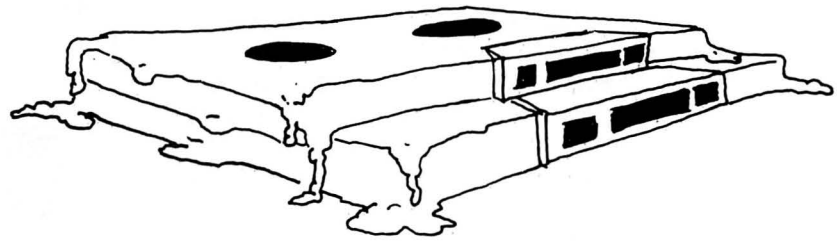
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CMERGEing The Easy Way

By Jorge Mir



This simple, straightforward program will allow you to merge cassette programs quickly and easily.

After you *CLOAD* the program and *RUN* it, the screen will display the amount of memory available so you can judge whether or not additional programs can be merged. In addition, the screen shows the beginning and ending RAM locations where your merged programs are located. The references are given both in decimal and hexadecimal formats.

If you are planning to merge large programs, you should make as much memory available as possible. This is done by typing in the following:

POKE 25,6:POKE26,1:NEW

POKE 25,&H0e:POKE 26,1:NEW (for disk systems)

You can then load the program and run it.

The program gives you the choice of continuing to merge, or ending the merging routine.

Selecting number 1 (continue to merge) will start loading the next program. Make sure the next program to be merged is in the tape recorder and the "play" button has been pressed. Once you select 1, the recorder will start immediately, so you have to have the tape ready.

After the new program has been merged, the computer will stop and the OK prompt should appear. At this point, you should renumber the program to make sure it does not conflict with the step numbers in the *CMERGE* program. Renumber the first program merged starting with line number 100. This is done by typing: *RENUM* 100,,10.

List the program and jot down the last step number. When you merge the next program, you will have to renumber it starting with a line number higher than the previous program's last line number.

This renumbering procedure is necessary, especially if your programs have any *GOTO* or *GOSUB* statements.

After renumbering, just type *EXEC* and ENTER and the *CMERGE* program will take over again and you will be ready to merge additional programs.

Please note that you must return back to *CMERGE* even though you are through merging programs. When back on *CMERGE* just select 2 from the menu to end the merging process. You can then list the entire merged programs, edit them, save them to tape or to disk, etc.

Once you have merged all programs and exited from the *CMERGE* program, you should delete the *CMERGE* section of the merged program. In its place, type in a menu to access the various merged programs, or just simply delete those step numbers.

If you get an "OM ERROR" when merging a new program in, that means you have run out of *RAM* and your merged program is too long. Simply type *EXEC* to return to the *CMERGE* program and end the merging process as described above.

Please note that the amount of memory available as shown on the screen does not take into consideration additional memory required by any dimension statements your programs might use. Therefore, it is quite possible to be able to merge programs that might subsequently give you an OM ERROR when you try to run them because there may not be sufficient room left in *RAM* for your dimension statements.

Closely following the above simple instructions will allow you to merge your programs successfully. Have fun!

The listing:

```
17..... 023E
END... 04A9
```

```
1 '          *CMERGE*
2 '        BY: JORGE MIR
3 '          1981 (C)
4 '
5 IF PEEK(&H2ØØ)=&H8E THEN 8
6 X=&H2ØØ:POKE X,&H8E:POKEX+1,PE
EK(25):POKEX+2,PEEK(26):POKEX+3,
&H9F:POKEX+4,&H19:POKEX+5,&H7E:P
OKEX+6,&HAE:POKEX+7,&H75
7 POKE&H9D,&H2:POKE&H9E,Ø
8 CLS:PRINT TAB(1Ø)"*CMERGE*":PR
INT
9 PRINT"MEMORY AVAILABLE:"MEM
1Ø A1=PEEK(25):A2=PEEK(26):A3=A1
*256+A2
11 B1=PEEK(27):B2=PEEK(28):B3=B1
*256+B2
12 PRINT:PRINT"START OF PROGRAM:
";:PRINT USING"######  %  %";A3;
HEX$(A3)
13 PRINT"END OF PROGRAM  :";:PRI
NT USING"######  %  %";B3;HEX$(B
3)
14 PRINT:PRINT"  1 - MERGE NEW P
ROGRAM"
15 PRINT:PRINT"  2 - END MERGING
 ROUTINE"
```

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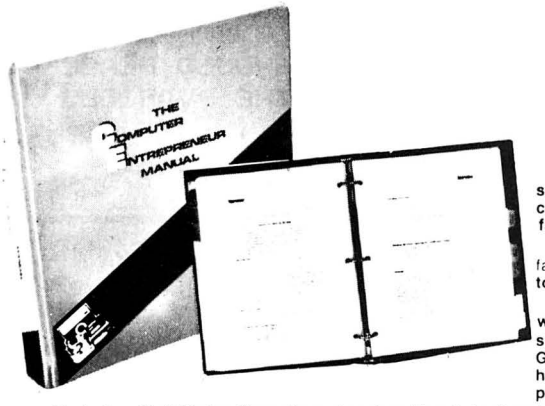
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```
16 PRINT @357,"YOUR CHOICE";:INP
UT I
17 ON I GOTO 19,24
18 GOTO16
19 CLS:PRINT:PRINT" RENUMBER THE
 NEW PROGRAM  WHEN  LOADING  IS
COMPLETED SO AS TO  AVOID CONFLI
CT WITH THE  OTHER  PROGRAM STEP
S."
20 PRINT:PRINT" TYPE 'EXEC' <ENT
ER> AFTER  THE  RENUMBERING IS C
OMPLETED TO GO  BACK TO 'CMERGE'
 AND  CONTINUE  OR END THE MERGI
NG  PROCEDURE."
21 IF B2<2 THEN 23
22 POKE25,B1:POKE26,B2-2:CLOAD
23 POKE25,B1-1:POKE26,B2+254:CLO
AD
24 CLS:PRINT:PRINT" YOUR PROGRAM
S HAVE BEEN MERGED  AND YOU CAN
NOW LIST, EDIT, OR  SAVE THEM TO
 CASSETTE OR DISK."
25 PRINT:PRINT" YOU SHOULD DELET
E THE  SECTION  OF  THE  PROGRAM
 THAT CONTAINS  'CMERGE' AND IN
ITS PLACE  YOU  SHOULD PLACE A M
ENU  TO ACCESS  THE  VARIOUS  ME
RGED PROGRAMS."
26 PRINT:PRINT:END
```


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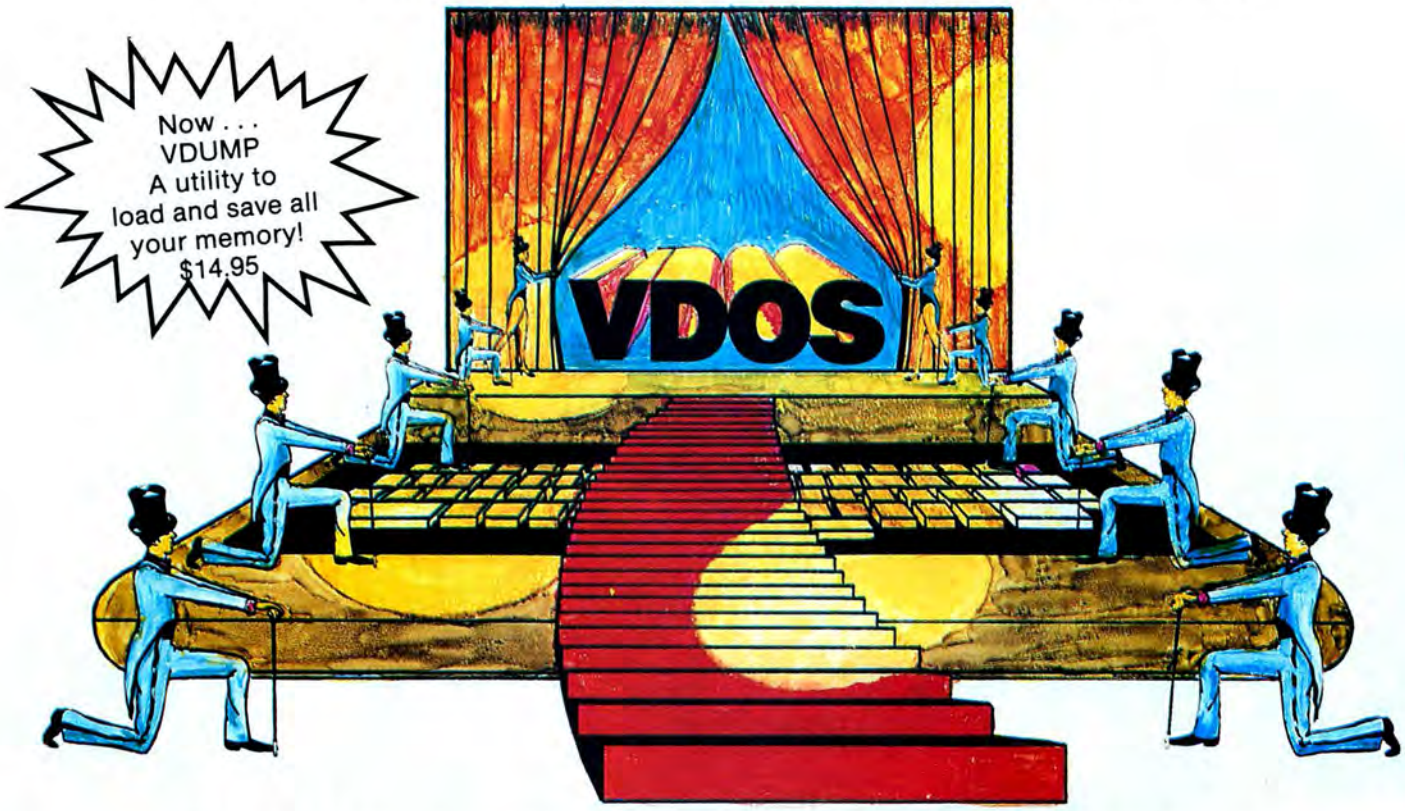
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RAINBOW

The Young, The Old And Color LOGO

By Sharon Bardus



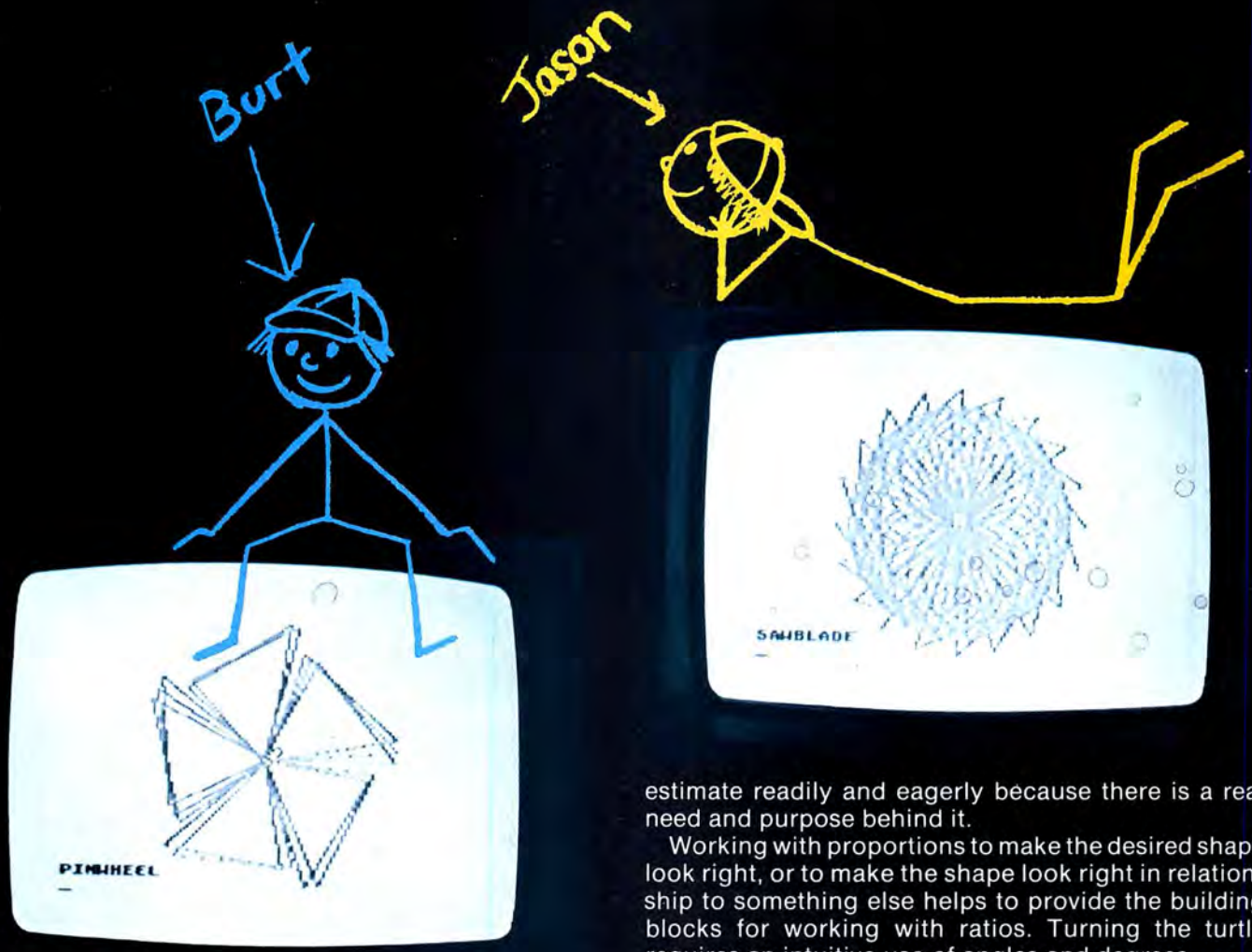
Helping children with *LOGO* is a rather tricky business. It is not a simple matter of reading and explaining the manual. Radio Shack's *Color LOGO* manual defines the role of the child as the explorer, and the role of the teacher as the guide. This challenging relationship requires much finesse. For a child to get the most out of *LOGO*, the helping adult needs to know when to guide and when not to. Sometimes it is difficult to stay in the background. *LOGO* is so much fun that an enthusiastic adult can quite easily and unintentionally "take over." It requires willpower not to.

If the adult intercedes too much, two negative results occur. First, the child is not allowed to go through the thinking processes to create an end product. In *LOGO*, the thinking processes are far more important than the actual program. Second, if too much help is given, the program becomes the parent's or teacher's and not the child's. Ownership is transferred. The child is robbed of the pride and self-esteem that comes with the completion of a program.

Knowing the history and theory behind *LOGO* should help an adult appreciate the significance and importance of *LOGO*. That information should, in turn, help the adult determine how to guide the child better.

In the sixties, working on mainframes in the artificial intelligence laboratories at MIT, many people helped to develop and experiment with *LOGO*. Seymour

(Sharon Bardus is a third grade teacher at Southwestern City Schools, Columbus, Ohio. She holds a B.S. in early and middle childhood education and an M.A. in curriculum and foundations from Ohio State University. She and her husband, Glenn, sell educational programs under the name of B5 Software.)



Papert guided much of this work. Papert had spent five previous years working with child psychologist, Jean Piaget. Piaget's work has greatly influenced education. Behind most of his theories is the idea that children will learn better by themselves, when there is a purpose or meaning to that learning that is useful to the child.

Papert extended this idea to computers and children. While programming in *LOGO*, children teach a computer how to think. This in turn improves a child's own thinking abilities. To draw lines, shapes and geometric patterns, children use important mathematical concepts without ever having had formal instruction in them. They are able to do this because there is a need and a reason to do so.

Children work with variables to change the number of repetitions, or the colors, or the degree of turns. Estimating distances must be done each time a line is drawn or a turn is made. In a classroom math lesson, many youngsters are afraid to estimate. They are afraid of giving a wrong answer. In *LOGO*, children will estimate readily and eagerly because there is a real need and purpose behind it.

Working with proportions to make the desired shape look right, or to make the shape look right in relationship to something else helps to provide the building blocks for working with ratios. Turning the turtle requires an intuitive use of angles and degrees.

LOGO provides numerous problems that children can solve with a thoroughness that is hard to find elsewhere. To "debut" a program, a child must learn to break the problem into small components until the problem is identified and corrected. Self-correcting with a purpose becomes a natural phenomenon. Children learn that errors can be beneficial because they lead us to study what happened and why. Thus, the processes of creating a program in *LOGO* far outweigh the importance of the end product.*

With all this thinking going on, who would want to interrupt it? Unfortunately, well-meaning adults are often overcome by their own enthusiasm. They interrupt the child's thinking because they visualize a different end product, one that is fancier or more complex. Or, they want to show the young programmer a more efficient way to write the same program. Children are quite willing to let this happen, yet, the child's own discoveries are interrupted and the child passes ownership of the program over to the adult.

* Papert, Seymour, *Mindstorms, Children, Computers, and Powerful Ideas*

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Tom Nelson — **Start Your Own Software Business**

Tom is a Rainbow *columnist and one of the owners of Nelson Software Systems.*

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Frank, who will be joined in this seminar by business programmer Dennis Mitchell, is principal of Color Software Services, *a division of* Brantex, Inc..

PLUS...RAINBOWfest's "CoCo Community" Breakfast featuring Mark Yamagata, Radio Shack's New Director Of Computer Merchandising for Personal Computer Products.

Mr. Yamagata has just been appointed to this position, which among other responsibilities, has overall supervision for the Color Computer. This will be among his first public appearances in his new capacity.

Additional seminars are planned as well. Admission to all seminars is at no charge. See registration form for admission prices to exhibit area and breakfast.

COME TO RAINBOWfest FORT WORTH —SEE COCO'S OWN HOMETOWN!

Computer literacy, developing higher level thinking skills, increasing pride and self-esteem can result from using *LOGO.* To let this happen, a parent or teacher needs to be able to accept a program or the manner in which it is written as an expression of the child, at his or her own level. Healthy respect is an essential ingredient in any collaboration.

Steeped in all this theory, I eagerly introduced my third graders to *Color LOGO.* I enthusiastically showed them the commands FD, BK, LT and RT, and I explained how to put numbers with the commands. As a class, we experimented together until we reached the magical 90-degree turn. Then with more exploration we built a square. From a roomful of waving hands, I selected two "lucky" students to investigate the world of *Color LOGO.* Within minutes, the novice programmers interrupted the class to find out why the computer did not understand their commands of up and down. Obviously, intervention was necessary.

Young children have difficulty orientating themselves to the direction the turtle will move on the screen. They do not realize commands such as forward or right can be any direction depending on the placement of the turtle.

Using the body to do walk-through exercises is a good way to help children grasp the sense of direction required for *LOGO.* I had my class stand up and face the board. I told them to move forward three steps. Then turn right. They continued this movement three more times. After the last movement, the children were again facing the board. I asked them, "Were you facing the same way each time you moved forward or turned right?" The students then realized forward or right could really be any direction. We continued doing more walk-through exercises adding the commands backward and left. Body walk-throughs are a good way to help children orientate themselves to the screen turtle and think about movements they want the turtle to make.

Explanation and guidance are definitely necessary when helping a child use *LOGO.* So, however, is time for thinking and self-discovery. A wise adult will balance the two discreetly.

Following are the first *LOGO* programs written by a nine-year-old boy, Jason Wright. Jason had had a few introductory lessons to *LOGO.* He had learned how to build a square with the class. He and my son Burt, age 12, experimented to come up with the triangle. The circle command was taken from the manual. When Jason began typing in the command square repeatedly, he was taught the repeat command and the turn command. He was also taught the color command. With these three shapes, and using the repeat and color commands, Jason developed these programs. Naming them was another enjoyable creative venture.

Appreciate these programs as beginning programs written by and belonging to a nine-year-old. Let your child copy them, change the variables, explore, and experiment. Watch as they change into programs belonging to your son or daughter. Maybe he or she will let you name them.

```
TO SQUARE
  FD 50
  RT 90
  FD 50
  RT 90
  FD 50
  RT 90
  FD 50
END

TO TRI
  RT 90
  FD 80
  LT 130
  FD 75
  LT 110
  FD 65
END

TO CIRCLE  *
  REPEAT 36 (FD 6 RT 10)
END

TO TOP HAT
  REPEAT 12 (PC 1 SQUARE RT 5)
END

TO PINWHEEL
  REPEAT 12 (PC 1 TRI RT 5)
END

TO SLINKY
  REPEAT 12 (PC 1 CIRCLE RT 5)
END

TO SQUARE-CIRCLE  *
  SQUARE
  CIRCLE
END

TO ROSE
  BG 1
  REPEAT 18 (PC 3
  SQUARE-CIRCLE RT 8)
END

TO SCT
  SQUARE
  CIRCLE
  TRI
END

TO SAWBLADE
  REPEAT 20 (PC 1 SCT RT 6)
END
```

*Taken from manual

See you at RAINBOWfest

October 14—16 Fort Worth, Texas



Greetings!

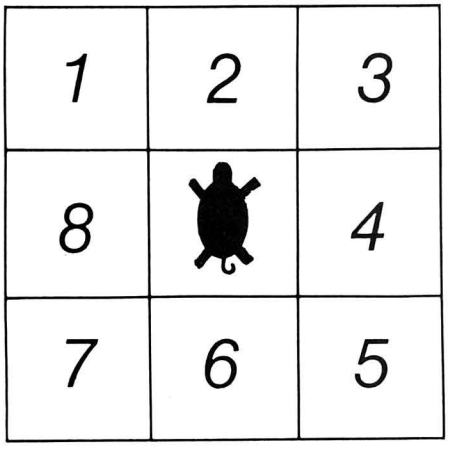
As you may remember, last month I was put in my place by a terrible thing. I was trying to make the machine draw a circle for me. I figured the most sensible way to draw a circle was to move forward one little step, turn to the right a degree, move forward another little step, and et cetera, 360 times. So I gave my turtle the following instructions:

```
TO CIRCLE
REPEAT 360 (FD 1 RT 1)
END
```

But the dagnabbed turtle drew a stop sign instead. I couldn't figure out why until one night last week, right in the middle of a chess game with Bertha. It was my move, and I wanted to move my horse, and I started to think about all the kinds of hopping that three-legged chess horses can do. Then, sort of like one of those hallucinations, I started seeing a turtle right on the chessboard. If you told it to turn one degree to the right and at the same time move one square ahead, what would it do? Well, depending on the rules of the chessboard, it might do a number of things. But if the rules said it could only be in the middle of one square at a time, then when you told it to move one square forward while turning one degree right, it might be gradually turning to the right but for a long time it would have to keep hopping only into the square in front of it.

Make sense?

Let me draw the situation:



On the first move the turtle could hop forward one square, but as long as it's moving forward, it only has three squares to choose from (square 1, in front and to the left; square 2, directly in front; and square 3, in front and to the right). Well, obviously the turtle will keep hopping to the square directly in front of it until all those one degree turns add up to enough that it is inspired to hop to the square in front and to the right. How much is that? Well, if each time it hops a square it points one more degree to the right, then it will be pointing *directly* at the square in front and to the right after 45 hops (adding up to 45 degrees). That means that once it's pointing at about 22 and a half degrees, it should be ready to make its leap to the square in front and to the right. It should keep on leaping to the next square (each time front/right) until the number of accumulated degrees makes it turn enough so that it can begin leaping to square 4.

That more or less makes sense. I decided to check my reasoning by making the turtle trace over the stop sign a few steps at a time. Doing that, I found that each of the turns was 45 degrees. That seemed reasonable, since the centers of those boxes should be 45 degrees apart from each other. But—but—but I found that half the sides were about 60 steps long and the rest were about 43 steps long. Altogether that adds up to some 412 steps, instead of the 360 I expected.

Weird! I keep thinking about a turtle on ice skates who is trying to make a turn but sliding and sliding and sliding until all at once he makes a nice big turn. One thing I thought was that maybe the boxes weren't really squares after all, but rectangles—that would explain why the sides of my stop sign were not all the same length. But why should the instructions "REPEAT 360 (FD 1 RT 1)" produce a figure that I can trace over almost exactly by telling the turtle to make a few 45 degree turns here and there and 412 forward steps? Of course, I could always say that the turtle has a bug. Anybody out there have a better explanation?

I also lost the chess game—and I blame it entirely on the

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distraction of thinking about turtles. I lost both my knights faster than you can imagine (after nefarious footwork on the part of certain pawns and others). But I'll tell you one thing. The turtle doesn't do very well when you tell it to make little steps and turns. It's got ice skates. So, maybe we should try to make a "circle" with bigger steps and bigger angles (we'll really have a polygon, but maybe it'll look like a circle).

```
TO CIRCLE2
REPEAT 36 (FD 8 RT 10)
END
```

That looks okay. Let's try to get fancier. How about making it circle around itself?

```
TO CIRCIR
REPEAT 36 (CIRCLE2)
END
```

Whoops! I forgot to reorient it each time. How about this?

```
TO CIRCIR2
REPEAT 36 (CIRCLE2 RT 10)
END
```

Neat! Looks like a jelly doughnut. How about a real doughnut?

```
TO CIRCIR3
REPEAT 36 (CIRCLE2 RT 10 FD 10)
END
```

Not very good! Can you do better? I'm going to play around with the angle and the forward step in "CIRCIR3."

```
TO CIRCIR4
REPEAT 36 (CIRCLE2 RT 10 FD 20)
END
```


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Still needs work. How about moving the turtle over on the screen before starting the whole thing? Did I mention that the turtle will move without leaving a line if you instruct it "pen up" ("PU" stands for "pen up" "PD" for "pen down")?

```
TO CIRCIR5
PU LT 90 FD 105 RT 90 PD
CIRCIR4
END
```

Pretty good, but could be better. You make it better, okay? Moving right along, let's try to doughnut a diamond. A diamond might be something like this:

```
TO DIAMOND
FD 45 RT 40
FD 45 RT 140
FD 45 RT 40
FD 45 RT 140
END
```

I guess if we're working in the same fashion as we did with the circle, we might first try spinning it. How would I do that? I'm thinking, I'm thinking. Well, maybe if at the end of each diamond I reorient the turtle a little and have it draw another. Let's say I'll reorient the turtle five degrees to the left—how many times do I have to redraw it to make a complete diamond circle?

```
TO DIAMONDCIR
REPEAT 72 (DIAMOND LT 5)
END
```

Well, that was okay. Ben likes it, I think. He's been watching the screen and then licking my toes, and darn, it tickles! One thing about having a linguistical dog, you don't have to bathe nearly as much as ordinary people. Dear Ben! Don't anybody tell me animals don't have feelings or sense. This dog's all sweetness and light, except for sometimes a shade of melancholy around the eyes and a little mischief. Anyhow, let's now try for a diamond doughnut. How did I do the circle doughnut? Let's do something similar:

```
TO DIADOUGH
REPEAT 72 (DIAMOND LT 5 FD 5)
END
```

Well, that was not too terrible. I think I might try something with pen up and pen down and see if I can sneak that diamond over and keep it pointing directly outward. Meanwhile, I hear thunder. Aunt Bertha's calling. I hope she hasn't run into any more bristles. She tells me she'll never ever speak to me again if I mention the pig incident one more time. How was I to know the pig would roust himself at the worst possible moment? By the way, did you see the excellent comparison of the various forms of *Logo* and the turtle graphics programs in the August issue of *Popular Computing?* If you didn't, I recommend you check it out. Especially you, Doug! I remain,

Uncle Bert

P.S. You can send your cards and letters to me in care of my good friend Dale Peterson. Just address them like this:

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ON USING PRINT USING

By Richard A. White
Rainbow Contributing Editor

In many programs, readability and understandability of the data sent to screen or printer requires an output in different form than the way the data is stored in the computer. For example, dollar amounts may be typed in a number of different ways and stored accordingly in the computer. For the output, we want these values all printed in the same format and aligned on the decimal point. The following table will give you an idea of what this means.

INPUT	DESIRED OUTPUT
123.2	$123.20
4231$	4,231.00
-22.78	$-22.78

BASIC routines to convert a number to a string and format it to the desired form could be written. Why bother when *PRINT USING* in Extended BASIC is there to do it for you? *PRINT USING* gives you wide flexibility in formatting numbers and some string formatting capabilities as well. In the text of this column we will describe how *PRINT USING* works, and some of the jobs it can do. The listing at the end is a tutorial and practice program that covers each *PRINT USING* form in a step by step way, shows how *PRINT USING* responds to various inputs and lets you try various inputs of your choice. Save the program to tape or disk and call it up in the future when you want to use *PRINT USING* and need a refresher, or need to test if what you want to do will work. Educators may find some ideas here for writing tutorial programs of their own on other subjects.

PRINT USING needs two pieces of data to work. It needs to know how you want the output formatted and it needs to have the data to be output. Here is the basic syntax for outputting a number:

```
PRINT USING "#####";D
```

D is the variable containing the number. "#####" is a string that tells *PRINT USING* the format. I will call it the "format string" from now on. In this case, "#####" says "print D as an integer number with up to five digits. Here are some examples.

D	FORMATTED OUTPUT
345	345
345.89	346
23456.4	23456

Note that the output is aligned right and that the decimal part has been rounded. This is true rounding as opposed to INT() and FIX() which only chop the excess. By the way, 0.5 rounds up to 1.0, while 0.49999 rounds down to 0.0.

PRINT USING works from your keyboard as well as from a BASIC program, so fire up CoCo and let's get some action along with the reading. Type in the following:

```
D=12345.6
OK
S$="$##.###.##"
OK
```

The computer now has some data, 12345.67, and a format string named S$ in memory. The format string "$##,###.##" will tell *PRINT USING* to print a $ on the left, allow space for five integer and two digits after the decimal point, print a command when there are more than three integer digits and print a decimal point with two digits to its right. Let's try it on the keyboard. Type PRINT USING S$;D and press ENTER.

```
PRINT USING S$;D
$12,345.60
OK
```

It worked and it's easy. Here is something else that works. Press CLEAR and type PRINT@100, USING S$D ENTER.

```
PRINT @100,USING S$;D
   $12,345.60
OK
```

This means that you can print a formatted output exactly where you want it on the screen. And don't forget using a ; after D to hold the cursor position to the end of the last character printed and avoid wiping off other things printed

---

(Richard White has a long background with microcomputers and specializes in BASIC programming. With Don Dollberg, he is the author of the TIMS data base management program.)

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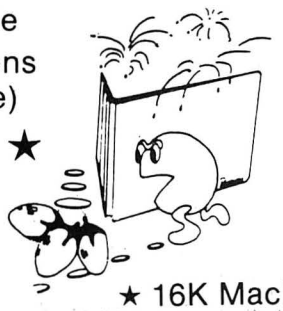
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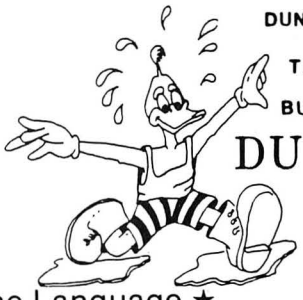
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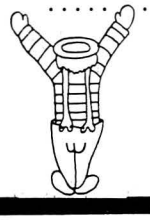
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on the same line. You can show this from the keyboard by typing CLEAR and then PRINT@100, USING S$D;D; ENTER.

```
PRINT@100, USING S$;D;
   $12,345.60OK
```

CoCo can output to screen, cassette, printer and disk. It turns out that *PRINT USING* will send formatted data to any of these devices. If you have a printer, turn it on and type PRINT#-2, USING S$;D and press ENTER.

```
PRINT #-2, USING S$;D
OK
```

Your printer will have printed $12,345.60

Here are two other keyboard exercises to demonstrate other *PRINT USING* properties. You type the lines indicated and the computer does the rest.

```
You Type   E=34.2
           OK You Type PRINT USING S$;E;D
           $     34.20$12,345.60
           OK
```

The computer allocated the same number of print positions for each number. The unused positions before the three were filled with spaces. The number of print positions is equal to the length of the formatting string. When it is not appropriate to print a character in the formatting string like the comma when the number has only two integers, *PRINT USING* prints a space. But, the numbers run together above and do not make a clear printout. One way to solve this is to provide *PRINT@XY, USING* statements separately to print E and D. But, there is another way. Try this at your keyboard.

```
You Type   S$="     $##,###.##"
           OK You Type PRINT USING S$;E;D
             $     34.20     $12,345.60
```

Much better. Any ASCII characters can precede or follow the number formatting characters and will be printed as typed into the formatting string.

```
You Type   S$="$##,###.##   PAID"
           OK You Type D=234.75
           OK You Type PRINT USING S$;D
           $    234.75 PAID
           OK
```

If you have been typing along with me you should have the basic *PRINT USING* idea and syntax well in hand. Let's now look at the various formatting options *PRINT USING* gives us. Each is accomplished by configuring the format string in a specific way. Examples of each type of format are included in the tutorial and practice program at the end of this article. Below is the practice code only. I recommend that you type it in now. Then, I will assume that you are running this program and can call each string, enter data and see result as the discussion continues.

```
10 CLS: DIMS$(20): S$(2)="#####.###": S$(1)="#####":
S$(3)="##,###.##": S$(4)="**,###.##": S$(5)="$####.##":
S$(6)="$$###.##+": S$(7)="**$###.##+": S$(8)="+##.##":
S$(10)=-##.##": S$(9)="AMOUNT $$#.##↑↑↑↑": S$(14)
="!"
11 S$(12)="%%": S$(13)="%%": S$(11)="##.##" : NO$=
"things to note;"
100 CLS: FORX=1TO13STEP2: PRINTX;S$(X) ;TAB
(16)(X+1)S$(X$+1): NEXT
120 PRINT@224,"ENTER STRING #";: INPUTS
125 PRINT@224,S$(S): PRINT"ENTER DATA ";:LINE
INPUTD$: PRINT
130 IFVAL(D$)<>0 THEN D=VAL(D$): PRINTS$(S):
PRINT USING S$(S);D ELSEPRINTS$(S): PRINT
USING S$(S);D$
140 INPUT dATA sTRING";A$ PRINT@224,,,,,,,,,,,,,:
IFA$="S"THEN 120 ELSE 125.
```

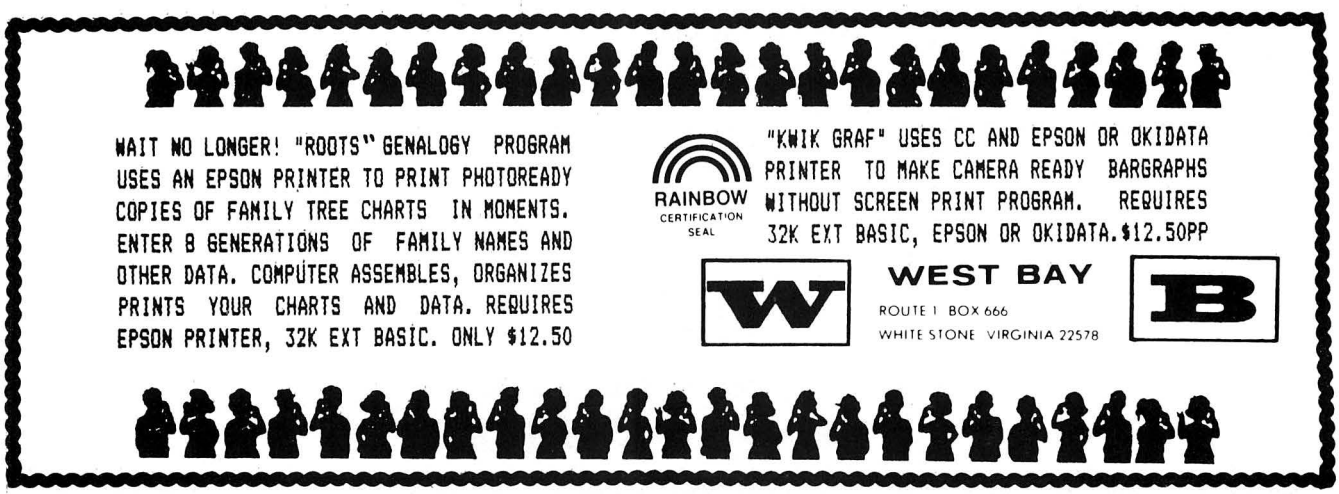
When you *RUN* this program, it prints the internally defined format strings (lines 10 and 11), and asks you to enter the number of the string you wish to work with. Your display should look like this:

```
1 #####                2 ####.###
3 ##,###.##            4 **,###.##
5 $####.##             6 $$###.##+
7 **$###.##-           7 +##.##
9 AMOUNT $$#.##        10 -##.##
11 ##.##↑↑↑↑           12 %%
13% %                  14 !
ENTER STRING #?
```

A number of these format strings have been discussed or should be fairly obvious from what we have already said. One *PRINT USING* property common to all number formatting strings is overflow. Let's see it work.

```
ENTER STRING #? You Type 1 <ENTER>
#####
ENTER DATA     You Type 123456 <ENTER>
%123456
   dATA    sTRING?
```

The format string, #####, was set up for five digits. We gave





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it six and it responded %123456. In this case, the computer can do no right. When it prints what it did, your presentation will likely be fouled up. If it chops a digit from either end, the value printed is meaningless. Rounding doesn't help since six digits are still necessary to communicate the size of the number. 123000 and 123456 are the same order of magnitude and could be interchangeable for some engineering

*"BASIC routines to convert a number to a string and format it to the desired form could be written. Why bother when **PRINT USING** in Extended BASIC is there to do it for you? **PRINT USING** gives you wide flexibility in formatting numbers and some string formatting capabilities as well."*

applications, but six digits are still required. One way out is to lengthen the format string to, say, #######. This now provides for seven characters. Another way, in applications where rounding to a preset number of significant figures is acceptable, is to use String 11.

```
ENTER STRING #? You Type 11 <ENTER>
##.##↑↑↑↑
ENTER DATA      123456
  1.23E+05
```

This can deal with any size number that CoCo can handle. Two digit spaces left of the decimal point are required to hande a digit and a minus sign when the number is negative. Up to eight digits right of the decimal point could be specified. You can also use it with other formatting characters. For example, a string $##.##↑↑↑↑ and 123456 for data will print $ 1.23e+05. However, I can hear our accountant readers screaming NO! NO! NO!

String 4, **,###.## will print up to five digits left of the decimal point. If less than five digits need be printed, the unneeded digit spaces are filled with *s.

```
ENTER STRING #? You Type 4 <ENTER>
**,###.##
ENTER DATA      You Type 1234 <ENTER>
*1,234.00
```

This notation can be used with a "$" to print an amount on a check that cannot be easily altered.

```
ENTER STRING #? You Type 7 <ENTER>
**$###.##-
ENTER DATA      You Type 123.7 <ENTER>
  **$123.70
```

And while we are dealing with money, let's put the dollar sign immediately before the leftmost digit and NOT fill out with *s.

```
ENTER STRING #? You Type 6 <ENTER>
$$,###.##+
ENTER DATA      You Type 123.7 <ENTER>
  $123.70+
```

PRINT USING will print a minus sign left of the leftmost

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digit when numbers are negative and the format string does not give other instructions. Remember to allow for this when you are calculating how long a number to make the format string for. You can force a sign to be printed and cause it to print on either the left or the right of the number. Accountants like signs to be on the right of the number in some instances. String 7 was used above. Its form is **$###.##-. The "-" at the right causes the sign to print at the right only if it is negative. Compare the following to the example above.

```
ENTER STRING #? You Type 7 <ENTER>
**$###.##-
ENTER DATA  You Type -123.7 <ENTER>
**$123.70-
```

The example using String 6, above, printed a "+" after the number. This was forced by the "+" at the right of the string, $$###.##+. A "+" on the left like in +##.## will cause a sign, either a "+" or a "-" to always print left of the number. Now here is a weird one. If the format string is -##.##, a minus sign will always print left of the number irrespective of whether the number is positive or negative. If anyone can figure out where to use that one, let *the Rainbow* know.

We noted before that ASCII characters other than those that effect formatting can be included in the format string. Now we will look at a couple of format strings that work on other strings rather that on numbers.

```
ENTER STRING #? You Type 14 <ENTER>
!
ENTER DATA  You Type JOHN <ENTER>
J
```

So that gets the first letter of a word and prints it only. If you want more of the string, use %% or % % as the format string. Each "%" reserves one character space. Spaces are added between the two %s to extend the format string to as many characters as you need. The string is aligned left. Here are two examples.

```
ENTER STRING #? You Type 13 <ENTER>
% %ENTER DATA You Type Jim <ENTER>
Jim

ENTER STRING #? You Type 13 <ENTER>
%  %
ENTER DATA You Type Lonnie <ENTER>
Lonnie
```

Please remember that when printing a string, the data is held in a string variable. The *PRINT USING* statement must be coded accordingly.

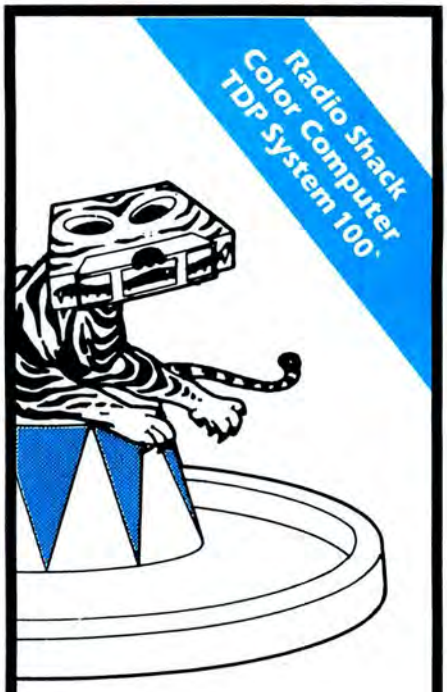
```
PRINT USING S$;D$
```

Finally we mentioned that *PRINT USING* can be used to format data sent to a tape or disk file. The topic is covered very briefly in the CoCo Disk System Manual. Following is a short program to save dollar amounts to tape (if you want to use a disk drive, just change each -1 to 1) and then read them back in and print them.

```
10 OPEN"0",-1,"TEST"
20 INPUTA:PRINT #-1,USING"$##,
   ###.##";A:IF A<>  THEN20
30 CLOSE
40 PRINT"REWIND, SET TO PLAY
   AND PRESS  <ENTER>":
   INPUTA
50 OPEN"I",-1,"TEST"
60 IFEOF(-1)THENCLOSE:END
70 INPUT#-1,A$:PRINTA$:GOTO60
```

Note well that while numbers can be saved from a numeric variable, they are saved as strings and must be read back into a string variable. Also, while *PRINT USING* does not change a number or string in memory, it does change if it is used to put that data to tape or disk. There must be a creative use for this somewhere.





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Okidata's ML92: Quality, Speed And Compactness

The previous line of printers by Okidata, the Microline80 series, offered the CoCo user a rugged, high quality printer with economical ribbon (spools, not cartridge) replacement and a "no extra cost" serial interface. What is the incentive for going to the ML92 printer? There is quite a bit, but alas, with some penalties!

Let's hit the most important subject for CoCo users first, the serial interface. Early literature and distributor ads indicated that the new printers were available with either parallel or serial, not both, interfaces at the same price. Unfortunately, when ordering time came, it was apparent that the only way the printer came was with a parallel interface and optional extra cost serial board. I don't know why Okidata changed its strategy, but I feel the extra cost was justified. As a previous happy ML82A owner, I am now a very pleased ML92 owner.

Now let's get down to some of the goodies that justify (right justify, even) the cost. First, the new printers are fast, 160 cps at 10 cpi (10 pitch). This rate is even more impressive if you set printer and computer to a 2400 Baud rate, as opposed to the normal 600 Baud. With the 2K buffer in the printer, the printing is full speed bidirectional with no pause.

For type styles, or fonts, there are 5, 6, 8.5, 10, 12 and 17.5 pitch. These are all available in the data processing mode, which is the fastest. These can be printed at enhanced (½ dot vertical) or emphasized (½ dot horizontal) double strike. Underline, subscripts and superscripts are supported.

Where the ML92 really shows its colors is the correspondence mode. This replaces the data processing font with one which is a close approximation to standard typewriter characters. The letters are formed in two passes. This is not the same as double strike. Some of the dots are printed on the first pass, then the letters are completed on the second pass. This has to be seen to be appreciated. The effect is to eliminate the dot matrix look from your final printed letters, term papers, etc. The descenders do not have the stunted appearance of Radio Shack printers. The print speed is reduced to 40 cps to accomplish this feat and the 17.5 pitch cannot be used.

Vertical and horizontal form controls are very complete. These include tabs, form length, dot tabs, print start, and left margin. Correspondence mode supports proportional spacing between characters with the appropriate software.

In the dot graphics mode, seven pins out of nine can be addressed, which requires only printer codes from 0 to 127 (seven bits). There are control codes for entering and exiting graphics without having to pre-specify the number of graphics characters to be printed. For this privilege, there is a slight quirk. The CHR$(3) is not printed. In fact, trying to print CHR$(3)CHR$(2) will return to the text mode. Solution: in software, detect that a CHR$(3) is to be printed, then send it twice. Dot resolution is up to 72 by 72 dots per inch, which can fill an 8½" x 11" sheet with the full PMODE4 screen at 3 x 3 dots per pixel. Unfortunately, the TRS-80 6 block graphics are not provided, they stayed with the ML80 series.

Need Greek or Hebrew? Then make your own characters using the Down-line Loadable Character Generator (DLCG). This is custom programming with a resolution of 7 vertical dots by 11 horizontal half dots. Up to 96 characters may be stored in the printer.

On the mechanical side, the Okidata printers are very rugged and their printing precision appears to hold up. The paper feed pins are on the platen which means you don't waste a sheet of paper whenever you start to print. An optional tractor attachment is available to print narrow paper or labels.

You will probably have to install the serial board yourself. It is essentially piggyback on the parallel board. The only trick is to watch that no wires get pinched when all the screws are finally tightened down. With the serial board in there is no longer access to the parallel connector. While you are at it, the ability to externally switch between 600 and 2400 Baud may be made by soldering two wires across dip switch SW6 on the serial board. These are connected to a SPST switch that can be conveniently mounted on the plate used to cover the parallel port.

There are two versions of the instruction manual. The correct one is fully typeset with good quality illustrations. If you receive the manual with Okidata type printing, contact Okidata for a replacement.

Overall, the ML92 is a compact, high quality printer that should have a long life and provide sufficient versatility for most users.

(Okidata, Inc., 111 Gaither Drive, Mount Laurel, NJ 08054, $699)

—Joseph Kohn

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Use *CGE* To Build Character(s)

After being around computers for a while, I'm sure that you have heard of "word processing" and have a pretty fair idea of what some of the uses of a "text editor" are. Great! Now, how about guessing what a graphics editor is used for? You've got it; a graphics editor can be thought of as a "word processor" for creating graphics. CoCo Warehouse has recently introduced one of these editors which they appropriately named *Color Graphics Editor,* designed specifically for the Color Computer.

Color Graphics Editor (CGE) is a utility program designed to help create animated graphics figures on the screen. It is a machine language program which allows the advanced programmer to work in color graphics modes G6R, G6C, G3C or G2C.

After loading the program from disk or cassette, the programmer is given a choice of graphics mode to work in and color set for the particular graphics mode. Once these are chosen, the editing screen appears. This screen comes up in the graphics mode which you have chosen and has a box in the upper left hand corner with a blinking pixel used for a cursor in the box. On the right side of the screen is a matrix of hex numbers which correspond to the values stored in memory needed to create the figure drawn in the box. In creating a figure, the cursor is moved about the box with the arrow keys. Using appropriate keys, a pixel can be turned on to any color available, the background color can be changed, and the pixel's pattern can be shifted left, right, up or down. When you are through drawing a figure, it can be saved into one of four memory buffers. Once you have filled up the buffers with four slightly different positions of your animated character, there is a command that allows the buffers to display, in step fashion, one at a time on the screen. This allows you to test the animation for character building ranges from 10 x 16 in the G2C mode to 16 x 30 in the G6R mode. The box size is fixed, therefore, you lose some flexibility in the types of graphics that can be generated. Larger pictures, such as background scenes, require building various boxes and stringing them together.

There are actually two editing modes with this program. There is a mode that allows direct access to the hex data table. With this, minor changes can be made after a figure is drawn rather than having to move the cursor all over the graphics box to make a change.

This program is designed for the more sophisticated programmer, because the output of this program is a file of code configured in a FDB format recognized by an assembler. Output can also be in a BASIC file with the hex code written into a series of data statements which can be appended to a BASIC program. In either case, these may be of little use to a neophyte programmer.

CGE is a program which I found to be easy to use in generating graphics animation. The instructions are well written with no obvious errors. The instructions could be enhanced and more helpful to an intermediate programmer if specific examples of merging data to BASIC programs were described.

The program comes on tape, with instructions to easily transfer to disk. Its only real use is in the disk format, because there is no tape data file saving feature built in. A somewhat puzzling feature is that it is written for a 16K machine in non-relocatable code. Since it was evidently designed mostly for disk use and most disk systems are at least 32K, it would be nice to have it relocatable.

With the exception of these few minor flaws, this is an excellent program designed for the advanced programmer looking for an easier way to animate assembly language programs.

(CoCo Warehouse, 500 N. Dobson, Westland, MI 48185, $19.95 on cassette)

—Thomas Szlucha

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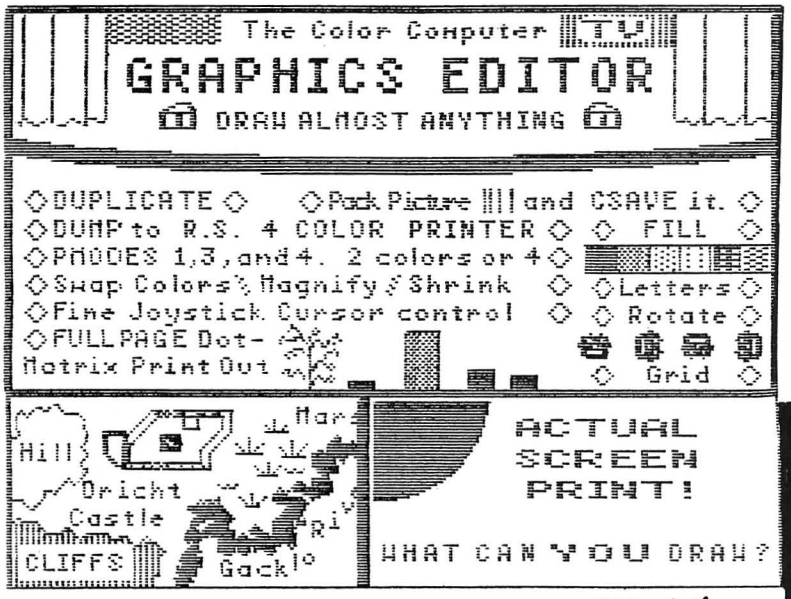
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```
LIST          ++++SCREEN TWO++++
10 CIRCLE(126,96),56,1
20 PRINT@12,"++++SCREEN TWO++++";
30 PRINT@430,"Black or White";:PRINT@464,"
Background";
40 POKE32753,4:POKE32754,64:PRINT@480,"Sel
ect 32 to 85 letters per line, 1 to 27 lin
es on screen.":POKE32753,5:POKE32754,51
50 PRINT"Works normally with most BASIC pr
ograms; Regular, Extended, or Disk."
60 POKE32753,6:POKE32754,42:PRINT"REAL low
er case.  Graphics as you watch."
OK
RUN
```

Black or White Background

Select 32 to 85 letters per line, 1 to 27 lines on screen.
Works normally with most BASIC programs; Regular, Extended, or Disk.
REAL lower case. Graphics as you watch.
OK

T.V. GRAPHICS EDITOR

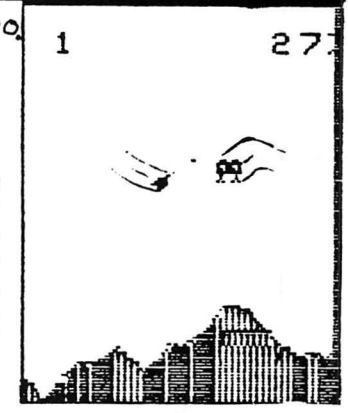
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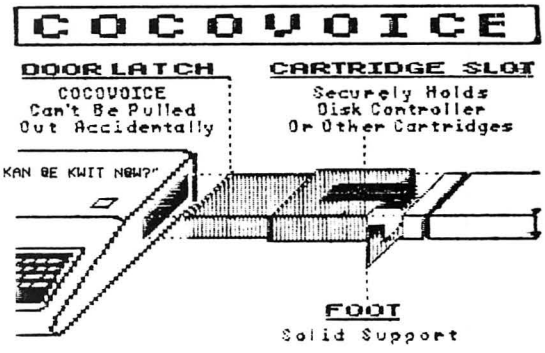
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```
10 FOR NU=1 TO 100
20 PRINT#-3,"THIS IZ A";NU
30 NEXT NU
40 PRINT#-3,"K@WNT KUMPLET. KAN @E KWIT N@W?"
```

COCOVOICE

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Good 'Hues' From *Rainbow-Writer*

By Dr. Charles H. Santee

Rainbow Connection Software has come up with a utility that offers good news and "hues" for programmers. Anyone interested in writing programs is soon faced with a need to mix graphics and text on the same display. *Rainbow-Writer* offers you this facility and more. When I first received the program, I began like a kid with a new toy. I hurriedly read a few instructions, casually tossed the documentation aside, and loaded a program (*LOADM"RW42":EXEC*).

I was greeted with a menu. The first task was to select an appropriate memory size for the machine I was using. After pressing "2" for 32K, I was asked for an "OFFSET." I didn't quite know what this meant so I pressed *ENTER*. I then received my first surprise.

A title page appeared with two lines of text at the top. It looked somewhat like a text page with black characters on a green background, but there was something different. The cursor was replaced by an underline and each line of text contained as many as 42 characters. After typing a few lines, the moment of insight finally hit. Aha! The text is written on the graphic screen and I was in the immediate mode of BASIC.

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I had expected that *Rainbow-Writer* would allow me to construct programs with text on a graphic screen. I had not expected that I would be able to operate in the immediate mode of BASIC with a graphics text display. Let me restate this, because the documentation is not clear on this point. After you load and *EXECute* one of the programs which generates predefined character sets (RW42 or RW64) you are given a preloader menu. You then answer two questions. Answer the first by pressing "1" if you have a computer with 16K, "2" if you have a 32K or "3" if you have 64K. The next question which appears as "OFFSET?" allows you to delete part of the predefined character set (up to 99 characters) so that you have fewer characters to work with, but also use less memory. You are then transferred to the immediate mode of BASIC. Your text is displayed on a graphic screen. The return to text screen after any *PRINT* command is disabled. This means you can have as many as 64 characters and 24 lines with which to prepare and display BASIC as you are preparing the program. This is a very nice feature for those of you without a printer. You can see more of your program lines on the screen.

After this brief excursion, I went back to thoroughly read the documentation and ran the Demo program. The documentation lists the following features:

- User definable 224 character set. You are given a set of letters, numbers and graphics characters that you can easily change if you wish.
- Works in all *PMODES*. You can print using the standard print commands in all *PMODES*.
- Two character sets which produce four character densities—32 x 16 (32 characters per line with 16 lines), 42 x 24, 50 x 24, 64 x 24, plus double widths in *PMODE 4*.
- ML extension of BASIC completely interfaced and transparent. This means you can operate using standard BASIC commands to control the location of text including *PRINT@*.
- Automatic underline, superscript, subscript, reverse video, top and bottom definable scroll protect options. You can turn these on before using an option and off afterwards from a program or from the immediate mode of BASIC.
- User friendly, easy to operate via Status/Help screen, simple commands, no messy *PEEKs* and *POKEs*.
- Special *EDTASM+* command allows instant compatibility with Radio Shack's Editor/Assembler cartridge.
- The program includes a Demo program, tape/disk conversion instructions, character generator program and operations.

This program contains the features listed as well as a few more that I discovered. Once I understood what the program did, I found it to be extremely easy to use. Many of the features can be used by the standard Extended BASIC commands. You can switch from one mode to another. The actual number of characters per line and number of lines depends on the mode you select. In modes allowing four colors you can select the color of characters by using the *COLOR* command. You can also use four colors in *PMODE 4* to define the background and foreground of characters. The documentation refers to these colors as artifacted colors. These artifacted colors are fast becoming a favorite of a number of programmers. Take a look at the Shack's *Sands of Egypt* to see the type of display you can get with these colors.

All special commands are accessed by typing "CHR$(27)" then two to four letters to indicate the command. I found

this infinitely easier to remember than trying to use *PEEK* and *POKE*. If you forget the commands, you can type "CHR$(27) 'H.' " to get a help page that shows the commands and their present status.

Two separate BASIC programs are included with which you can generate and save your own character set. These programs were easy to use and greatly enhance the flexibility of the program.

Although not stated in the documentation, you can turn on the alternate text mode by typing "SCREEN 0, 1" and it will remain on. Thus, in the text mode, you can use that yellow background you sometimes see in commercial programs (like *Color Scripsit*).

Another nice feature of *Rainbow-Writer* is the ability to scroll protect the top and bottom lines. This allows you to effectively set a text window and draw pictures above or below this window. The text you print will scroll in the defined area. This is excellent for constructing Computer Assisted Instructional (CAI) programs for education, graphic adventure games and a variety of other uses. This feature can be used in the immediate mode so that you can experiment with the graphic commands in Extended Color BASIC and see both the command and the results of using that command before incorporating those commands into a program.

Rainbow-Writer includes instant compatibility with Radio Shack's *EDTASM+*. To use this feature, turn off all equipment. Insert the *EDTASM+* ROM Pack. Turn on the computer and enter "Q" from *EDTASM+* Editor. Load the version of *Rainbow-Writer* you wish to use, enter the parameters appropriate for the memory you have, and then type "PRINT CHR$(27) "E+.' ." You will then be back in the Editor/Assembler with the text displayed on the graphic screen. This makes it easy to alter *Rainbow-Writer* to your own specifications and/or add other assembly language code to make your own assembly language programs. This is a very nice touch that advanced programmers will love.

The program is designed so well that beginning BASIC programmers could probably use *Rainbow-Writer* with little trouble. However, the beginning programmer may find that the instructions in the documentation do not give a clear enough explanation of what can be done. Advanced programmers, I am sure, would like more information, but the ease with which this program is integrated with an Editor/Assembler and examples included in the Demo program make it easy to experiment to find the desired information.

All users should pay close attention to the last page of the documentation which gives a chart for *PRINT@* locations. This is an excellent aide in formatting the screen. A desirable addition to this chart would be a chart showing the X and Y coordinates for *PRINT@* locations. This would have enabled locating graphics around or through the text with greater ease.

When using a 64 character set in *PMODE4*, the letters are packed closely together and are difficult to read. However, this character set has two important functions. First, you can view larger sections of text as might be desired in some word or text processing programs you might want to write. Second, you can use this compact mode with your own defined character sets to put two or more characters together for special effects. For example, you might make a

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RAINBOW CERTIFICATION SEAL

figure by defining several characters and then use the *PRINT@* command to move this character across the screen. You may be able to construct BASIC language games with animated characters that come close to rivaling those that are written entirely in machine language.

Let me give a specific example of how this might be done. The standard character set includes a little man shown in six different views (one character for each view). Program listing #1 allows you to use the joystick to make this man walk and jump across the screen in eight directions. Now, I know this program will not work unless you have *EXECuted Rainbow-Writer*. However, I have included a simulation in program listing #2. This brief example moves a graphic character as you move the joystick. Just watch this second program operate and imagine that the character is a little man that takes steps with each move. This will give you a feel for the animation that is possible. In both cases, I used the sounds of steps to slow down the animation to a reasonable walking rate.

This brings me to what I feel is a major shortcoming of the program. You can define and save your own character set. You can create a separate character generating program which can be used with a BASIC program for your own marketed software product. However, there are no instructions given as to how to *MERGE* the machine language program and the BASIC program into one independent program. As a teacher, I am primarily interested in constructing educational programs which are easy to use. Having to load a machine language program and then a BASIC one is just an extra step for us simple-minded users to mess up.

In the short time I had to review this program, I tried some quick and dirty ways I knew of *MERGEing* BASIC and machine language programs (moving the end of the program pointer to incorporate the machine language program at the end of the BASIC line) but, to date, I have not been successful. The ideal solution would be to include a BASIC language frame which incorporates the machine language utility as part of the software package. The user would then simply load the frame, add the lines of BASIC to make the kind of program desired and then save the final product for future use.

As the software exists, I would rate this program as a "very good" utility and an excellent addition to a programmer's set of tools. It is easy to use, has many good features and I found no bugs.

To move this program to the "excellent" category, I would like to see the following features added:

1) A brief statement in the introduction or operation section that tells the user (in language that a beginner can understand) that after answering a few questions, the program returns to the immediate mode with text in a graphic display.
2) Instructions for *MERGEing* the machine language portions with BASIC for one integrated program.
3) A chart that shows memory locations and/or X and Y coordinates in relation to *PRINT@* locations for drawing graphics in relation to the printed text.
4) Additional aids for formatting text such as word wrap, centering text and left/right justification.
5) A keyboard, joystick, or XPAD (graphic tablet) graphics editor with a graphic cursor that is compatible with *Rainbow-Writer*.

In conclusion, I feel that Dan Larson and Paul Penrose should be commended for their work on *Rainbow-Writer*. This program is an easy-to-use, yet powerful tool for beginning and advanced programmers. I would especially recommend this program for teachers who want to write their own computer assisted instruction programs in BASIC.

(Rainbow Connection Software, 3514 6th Place NW, Rochester, MN 55901, $29.95 tape, $32.95 disk)

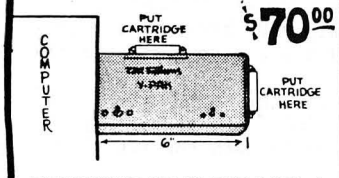
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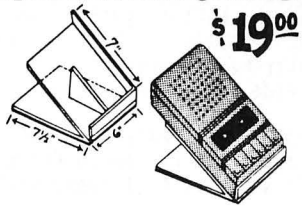
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Here's a short program that turns your name into a colorful display. Requiring 16K Extended Color BASIC, *Name Display* will create different patterns and colors for each name.

Pressing any key (but BREAK) returns the computer to the normal text mode.

—Randy Cassel

The listing:

```
5 INPUT"YOUR NAME";A$
10 POKE 359,128
20 PRINT A$
30 B$=INKEY$: IF B$=""THEN 20
40 POKE 359,126
```

READ THE FINE PRINT.
It's worth your time. This is good stuff.

SYSTEMS SOFTWARE

MACRO-80C

This is a **disk-based editor, macro assembler and monitor,** written for Color Computer by Andy Phelps. THIS IS IT — The ultimate programming tool!

The powerful 2-pass macro assembler features conditional assembly, local labels, include files and cross referenced symbol tables. MACRO-80C supports the complete Motorola 6809 instruction set in standard source format. There are no changes, constraints or shortcuts in the source language definition. Incorporating all of the features of our Rompack-based assembler (SDS80C), MACRO-80C contains many more useful instructions and pseudo-ops which aid the programmer and add power and flexibility.

The screen-oriented text editor is designed for efficient and easy editing of assembly language programs. The "Help Key" feature makes it simple and fun to learn to use the editor. As the editor requires no line numbers, you can use the arrow keys to position the cursor anywhere in the file. MACRO-80C allows global changes and moving/copying blocks of text. You can edit lines of assembly source which are longer than 32 characters.

DCBUG is a machine language monitor which allows examining and altering of memory, setting break points, etc.

The editor, assembler and monitor — as well as sample programs — come on one Radio Shack compatible disk. Extensive documentation included. **MACRO-80C Price: $99.95**

SOFTWARE DEVELOPMENT SYSTEM

The Micro Works Software Development System (SDS80C) is a complete 6809 editor, assembler and monitor package contained in one Color Computer program pack! Vastly superior to RAM-based assemblers/editors, the SDS80C is non-volatile, meaning that if your application program bombs, it can't destroy your editor/assembler. Plus it leaves almost all of 16K or 32K RAM free for **your** program. Since all three programs, editor, assembler and monitor are co-resident, we eliminate tedious program loading when going back and forth from editing to assembly and debugging!

The powerful screen-oriented Editor features finds, changes, moves, copys and much more. All keys have convenient auto repeat (typamatic), and since no line numbers are required, the full width of the screen may be used to generate well commented code.

The Assembler features **all** of the following: complete 6809 instruction set; conditional assembly; local labels; assembly to cassette tape or to memory; listing to screen or printer; and mnemonic error codes instead of numbers.

The versatile monitor is tailored for debugging programs generated by the Assembler and Editor. It features examine/change of memory or registers, cassette load and save, breakpoints and more. **SDS80C Price: $89.95**

MICRO WORKS COLOR FORTH

- Forth is faster to program in than Basic
- Forth is easier to learn than Assembly Language
- Forth executes in less time than Basic

Forth is a highly interactive language like Basic, with structure like Pascal and execution speed close to that of Assembly Language. The Micro Works Color Forth is a Rompack containing everything you need to run Forth on your Color Computer.

Color Forth consists of the standard FORTH Interest Group (FIG) implementation of the language plus most of FORTH-79. It has a super screen editor with split screen display. Mass storage is on cassette. Color Forth also contains a decompiler and other aids for learning the inner workings of this fascinating language. It will run on 4K, 16K, and 32K computers. Color Forth contains 10K of ROM, leaving *your* RAM for *your* programs! There are simple words to effectively use the Hi-Res Color Computer graphics, joysticks, and sound. The 112-page manual includes a glossary of the system-specific words, a full standard FIG glossary and complete source listing. COLOR FORTH ... THE BEST! From the leader in Forth, Talbot Microsystems. **Price: $109.95**

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- — Saving received text to cassette tape
- — Re-displaying the received text even while on-line
- — Communications with other computers
- — Using your computer as a general-purpose 300-baud terminal
- — Downloading programs from other computers

The Microtext module is a program pack containing not only firmware but a second serial port so that both your printer and modem can be connected at the same time. Microtext can be configured for any serial printer that will work with the Color Computer, even if it requires line feeds! But even if you don't have a printer, you can keep a permanent copy of your data by storing to cassette tape. Also, any Radio Shack/Centronics-compatible parallel printer may be used by adding the Micro Works' PI80C parallel interface.

For those of you with special terminal applications, Microtext has selectable parity; it sends odd, even, mark or space. With mark parity (which is default) you can send to computers requiring either seven or eight bits. All 128 ASCII codes can be sent. Exchange programs with other Color Computer users! Basic programs may be downloaded from other computers or timesharing systems.

You'll find many uses for this versatile module! Available in ROMPACK, ready-to-use, for **$59.95.**

MACHINE LANGUAGE

MONITOR TAPE: A cassette tape which allows you to directly access memory, I/O and registers with a formatted hex display. Great for machine language programming, debugging and learning. It can also send/receive RS232 at up to 9600 baud, including host system download/upload. 19 commands in all. Relocatable and reentrant. **CBUG Tape Price: $29.95**

MONITOR ROM: The same program as above, supplied in 2716 EPROM. This allows you to use the entire RAM space. And you don't need to re-load the monitor each time you use it. The EPROM plugs into the Extended Basic ROM Socket or the Romless Pak I. **CBUG ROM Price: $39.95**

SOURCE GENERATOR: This package is a disassembler which runs on the color computer and generates your own source listing of the BASIC interpreter ROM. Also included is a documentation package which gives useful ROM entry points, complete memory map, I/O hardware details and more. A 16K system is required for the use of this cassette. **80C Disassembler Price: $49.95**

BOOKS

6809 Assembly Language Programming, by Lance Leventhal, **$16.95**

TRS-80 Color Computer Graphics, by Don Inman, **$14.95**

Assembly Language Graphics for the TRS-80 Color Computer, by Don Inman, **$14.95**

Starting Forth, by L. Brodie, **$19.95**

GAMES

Star Blaster — Blast your way through an asteroid field in this action-packed Hi-Res graphics game. Available in ROMPACK; requires 16K. **Price: $39.95**

Pac Attack — Try your hand at this challenging game by Computerware, with fantastic graphics, sound and action! Cassette requires 16K. **Price: $24.95**

Haywire — Have fun zapping robots with this Hi-Res game by Mark Data Products. Cassette requires 16K. **$24.95**

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HARDWARE

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HJL-57 Keyboard Has The Answer

The Color Computer has been widely mistaken by many people as just another game machine. This was mainly due to the fact that it had a "toy like" keyboard and a limited screen display. Many products have been introduced to overcome the screen format problem; however, up until now, not many solutions to the keyboard dilema have appeared. The *HJL-57* replacement keyboard is a welcomed solution to an existing need of your Color Computer.

The keyboard is available in two versions; one is for the original Color Computer up to and including those with "E" boards. The other is for the "F" board revision and TDP-100 computers. You must specify which computer you have when ordering the keyboard. There is no extra charge for either one of the keyboards. The key layout is identical to that of your Color Computer, with the exception of the four function keys. They are placed in pairs on each side of the spacebar. All the letter and number keys are a light gray color. The ENTER, CLEAR, and arrow keys are white, while the BREAK key is red. All of the keycap characters are molded into the keys with either black or white plastic. The keyboard comes with two spacers, four flat plastic washers, eight metal spring clips, and installation instructions.

COLOR COMPUTER WEEKLY

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All of the keys have sculptured tops which provide a firm grip for your fingers. A touch typist or hunt 'n' peck user will experience no lost characters, because the keys require very little pressure to activate. I would compare the feel of this keyboard to that of a Televideo or a DEC keyboard.

One of the four function keys is described as being "latchable." What this means is that when the key is depressed, it will remain that way until it is pressed again. Although the use of the function keys is not mentioned in the accompanying documentation, I have been assured by HJL that there will be software available very soon that will make use of these keys. In the meantime, however, there is a simple solution to make use of these keys thanks to Bob Rosen of Spectrum Products. In the June 1983 edition of *Rainbow,* an article appears by Mr. Rosen showing you how to program function keys. Type it in (plus add a couple of corrections noted in the July issue) and *RUN* it. It will work perfectly with the four function keys on your keyboard.

Construction of the keyboard is first-rate. The keyboard mounting plate is constructed of an extruded aluminum plate. A flat membrane sheet is attached to it. The keys are then mounted on top of the sheet to the aluminum baseplate. This type of construction provides you with an extremely sturdy keyboard package. Again, depending on which version of the computer you have, the proper keyboard connector is provided for the connection to the computer. The keyboard also carries a one year warranty, showing the confidence that HJL has in this product.

The installation instructions are simple and straightforward. Start by removing the screws from the bottom of your computer. Remember, opening the case *voids* any warranty from Radio Shack. Next, remove the keyboard unit from the computer and trim down the center support post. Place the two spacers provided onto the rear two posts, and connect the keyboard connector to the computer. Place the new keyboard onto the four support posts, lining up the holes with those in the aluminum baseplate. Place the four plastic washers over the posts and push on the four retainer clips. These clips may be removed at any time without difficulty if you ever want to remove the keyboard.

Now flip over the top half of the case and set in the custom black bezel, lining it up on the four posts in the case. Install the remaining clips and reassemble the case. The keyboard has been designed to meet the RFI and EMI shielding requirements, set by the FCC, which become effective October 1, 1983. With my computer, I noticed a very large reduction in picture interference. Installation of the keyboard took me about five minutes.

It is my opinion that all those who are serious about the potential of the Color Computer will definitely appreciate the quality and performance of the *HJL-57* keyboard.

(HJL Products, 955 Buffalo Road, P.O. Box 24954, Rochester, NY 14623, $79.95 plus $2 s/h)

—Ted Hasenstaub

Get The Most Memory

You can get the most memory available on your CoCo by entering the command POKE 25,6:NEW. This, in effect, is a *PCLEAR0* on your system.

This command will *not* work with a disk installed. It will, instead, clobber the disk operating system. If that happens, simply RESET CoCo.



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Let *Chroma Keys* Do The Walking

Tired of typing in programs from your favorite magazine? (*Rainbow*!) Don't have the bucks for *Rainbow On Tape, BASIC Aid,* or *Worksaver*? You can't keep up with all the good program listings you see or want to key into your CoCo; and it takes your hunt-and-peck fingers forever to type in programs?

Enter *Chroma Keys* to the rescue—a low-cost, effective utility program for the BASIC language programmer that reduces the amount of time required to key in listings. Extended BASIC is not required, and it should work with any cassette- or disk-based CoCo.

The program, in machine language, is very fast and performs its duties flawlessly. The 26 keys of the alphabet are assigned/defined with up to 12 characters per key. *Keys* comes with all 26 keys defined to get you started. It is with these keyword definitions per keystroke that you are able to speed up your BASIC programming time. After execution of *Keys* you are still in the BASIC mode and all functions, including the editing mode, are at your disposal with the addition of the *Keys* feature.

One of the bonus features is a key click. I, being a touch-typist, value this feature a lot. Several times, prior to reviewing this program, I have pressed keys and eventually not found them in the program later! Now, I know by the click that the key pressed was received.

The other features are obtained by simultaneously pushing SHIFT and up-arrow. By so doing, you have immediate access to all 26 defined keys, as well as a "help" display of the current definitions and a MENU MODE that

1) allows you to very quickly change any or all the key definitions,
2) save those definitions to tape or disk (especially if you develop your own personal set more to your liking),
3) turn the key click on or off,
4) display current definition of keys,
5) return from the menu and continue programming,
6) exit program.

Actually, you can save up to nine *Keys* programs numbered 1 through 9, and, I discovered (not documented) you can reload (*CLOADM*) those sets at any time during your programming without destroying any of your BASIC program or the ML utility, should your needs change drastically within the typing session. Also, once you've saved a *Keys* program with your own set of definitions, that program and definitions is complete in itself and can be *CLOADMed* instead of the original *Keys.*

I find it quite easy and very fast (within a couple seconds) to change the keyword and continue programming. An example of when it would be suitable to change definitions would be if you're typing along and you can see multiple lines of *PRINT* or *INPUT* statements coming up but already have the P key defined for *PRINTUSING* and the I key defined for *INKEY$*. I like to keep the associations as logical as possible so I take one or two seconds to jump into the DEFINE KEYS mode and redefine those two keys for *PRINT* and *INPUT.* Maybe after I finish that section of the program there seems to be more *PRINTUSING* or *PRESET* lines appearing so I redefine again. It's not really so

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confusing as it might seem changing back and forth as long as you keep the word association in mind and that word would start with the first letter anyway.

Now I'll show you one final example I used to make a complex LINE statement into a simple matter. Define
A: (A(X),A(X+1)
C: (C(Z),C(Z+1)
L: LINE(128,96), and
Z: PRESET (P was already needed for PRINTUSING). The program listing I was typing in alternated between LINE(128,96)-(A(X),A(X+1)),PRESET and LINE(128,96)-C(Z),C(Z+1)),PRESET. Now with only a handful of keystrokes instead of a lineful I was able to complete either *LINE* statement, not only in less time but with less hassle using parentheses.

I consider myself a pretty fair touch-typist and I must say that using a utility program with keys having defined keywords took a little getting used to. I thought to myself while typing in the first program listing using *Keys*, "This program would not be for the touch-typist. I have to look at the definitions to find the right key when I could have typed it in already!" *Not so!* Admittedly, it did take me more time at first, but it was something new and I wasn't familiar with *Keys* or how best to use the definitions. However, the more I used *Keys* I began to see better ways of redefining the keys to suit my needs through different sections of the listing. Touch-typing capability eventually added to the speed of programming.

Documentation was not perfect, but was nevertheless sufficient or above average for anyone to understand and use. There was a problem with incorrect offset numbers and memory clearing, but I was assured by the author that the documentation was an early release for the RAINBOWfest and that the corrections and additions would be in future releases. The program itself, once executed, guides you through all necessary functions without need for good documentation. However, I feel that the casual CoCo user may need just a little more information in the "Loading From Tape" section. You are clearly shown how to save your personalized set of definitions but are not quite as clearly instructed on how to load that program back into CoCo. If you try to *CLOADM* your program following the tape instructions with an offset, it will not load. (No offset is required after the copy is made.)

In using *Keys* I think probably the most important improvement that could be made would be to allow greater than 12 characters per key. Having more than 26 definable keys might be helpful too, although 26 were generally sufficient once you became acquainted with *Keys* and used a little pre-thought. And finally, I would suggest adding one more item to the MENU MODE: Print current key definitions to the printer. A minor thought, but it would be nice to have a hard copy, especially if you have more than one set of definitions saved.

There are other "key-defining" utility programs on the market with more bells and whistles. But they also cost considerably more. I found *Keys* very useful and it did everything it was meant to do. For under $10, this utility is certainly worth your consideration.

(Chroma-Systems Group, P. O. Box 366, Dayton, OH 45420, $9.95 tape, $13.95 disk)

—Kenneth D. Peters



VDUMP — A Must For *VDOS* Users

I had the privilege, about a month ago, to review a program which I thought had excellent potential. The subject of that review was the *VDOS* program by Dr. Preble. One of the items mentioned in that review was the author's promise of upcoming utilities to expand *VDOS's* capabilities. The subject of this review is one of those utilities. *VDUMP* is a machine language program designed to dump the contents of *VDOS* to tape or to load a previous dump into *VDOS*.

For those of you who may have missed the review on *VDOS*, a brief explanation follows. *VDOS* is a virtual disk operating system. The term "virtual" means that an item takes on an appearance of something other than that which it really is. The term "virtual disk" then means a disk system which really is not a disk system but takes on the appearance of one. *VDOS* will take half of the user memory for the disk system data storage. Thus in a 16K or 32K system you will lose half of the available memory. However, with a 64K system, the memory you will lose will be the 32K which lies under your ROM hidden from use. In other words, you will be using the upper 32K of RAM. Thus the only real loss will be the 2K required for the actual program. *VDOS* behaves like a disk system in that it allows the user to catalog programs in its data storage area in a manner similar to that of a disk system. Since the program to be stored under *VDOS* must already be in user memory, the data movement is memory to memory. This makes the data transfer very fast. The original *VDOS* did not have a dump facility with it. It required the user to load the programs to be cataloged on an individual basis each and every time the system was used. However, with *VDUMP* that all changes.

VDUMP comes on a cassette tape and unlike *VDOS* is not auto-loading. The documentation consists of three pages of single-sided typewritten material. The instructions are broken down into three sections: Introduction, how to use the DUMP function, and how to use the LOAD function. The instruction sheets are easy to read and follow.

VDUMP is loaded using the *CLOADM "VDUMP"* command. Once it is loaded, typing *EXEC* will get it running. *VDUMP's* start message then appears on the screen, along with the request: DUMP OR LOAD (D/L)? *VDUMP* is now awaiting your command input. How does your *VDUMP* work and why is it needed? Suppose you have already cataloged a series of programs under *VDOS* and wish to save the entire set of programs on cassette tape for later use. Without *VDUMP* you would have to recall each and every program from *VDOS* one at a time and *CSAVE* it to tape. This can be a long and tiresome process. With *VDUMP* the process becomes very simple. You load and execute *VDUMP*. *VDUMP* will now ask if you want to load the *VDOS* system from tape or save the contents of *VDOS* to tape. In our case, the save or dump would be the correct function. Placing the cassette recorder in the record mode and typing D to *VDUMP's* prompt will do just that. The file that is placed on the cassette tape will not be in standard RS format. That is, only one file per tape side can be done. Trying to position the tape past the first file using the SKIPF command will get an I/O error. There are ways to overcome this problem, I'm sure, but I did not investigate any of them. You have now saved the contents of *VDOS* for use at another time. Suppose at some future date you decided to pick up where you left off. The process is simple. First, you load *VDUMP* from tape and *EXECute* it. Second, you load the tape containing the previously saved data. Put the recorder in the PLAY mode and answer *VDUMP's* prompt with L. The load process takes about three to four minutes for a full 32K. Once the load is complete, *VDUMP* exits and control is returned to the BASIC interpreter, which promptly displays the familiar OK message. Once the OK appears you know the restore/load feature functioned properly. Now typing *VDOS* and performing a directory list will display the contents of *VDOS*.

VDUMP is a short utility which functions just as described in the literature. It will save the entire contents of *VDOS* to cassette tape in a single file. *VDUMP* will also restore a previous dump. Using *VDUMP* and a cassette tape is similar to changing a diskette in a standard disk drive. *VDUMP* is a welcome addition to a very good system. I see only one drawback. I think it would have been nice if *VDUMP* had the data on the cassette in standard RS format. Then more than one dump could have been placed on each tape. I liked *VDOS*, and it combined with *VDUMP* to form a great combination. The price has been reduced to a point where it is affordable by most everyone. Thus, for those who have a cassette-based system, the addition of *VDOS* and *VDUMP* would speed up and enhance that system considerably. I consider the *VDOS*/*VDUMP* combination to be an excellent addition to any serious CoCo library.

(Dr. Preble's Programs, 6540 Outer Loop, Louisville, KY 40228, $14.95 plus $1.50 s/h)

—Frank J. Esser

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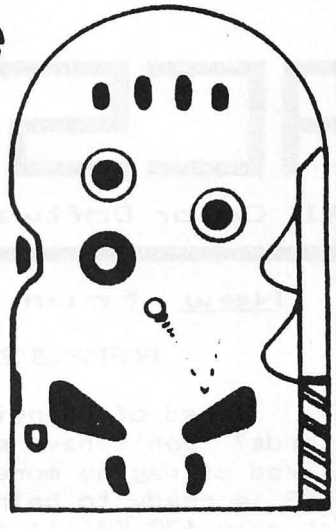
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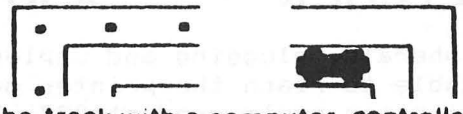


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Statgraf: A Powerful Regression Analysis Package

Statgraf is a new linear regression analysis package by Dennis D. Zaebst. In the course of my graduate studies, I used canned regression routines on a large mainframe from time to time. This new package from Sugar Software seems capable of doing all the things those routines could do and maybe more. It is an excellent program and does all it says it will. To use *Statgraf,* you need 32K of RAM. A printer and a screen print program are also desirable.

I am too limited by time, space and knowledge to give any type of discussion on linear regression technique or theory. So, I will limit my discussion to the capabilities of this package, which are many. First of all, the documentation is excellent. The 40-page manual includes a very good tutorial on the use of *Statgraf* which, while powerful, is very easy to learn and use. One pass through the step by step tutorial and all I needed from then on was the command reference summary. The tutorial takes you through an example problem which uses all the features of *Statgraf.* A technical appendix is included with instructions for interfacing a screen print program and also a brief discussion of regression terminology which serves as a good review.

Data pairs can be entered from the keyboard or from a tape/disk data file. There is room for up to 250 observations. The package contains a powerful data editing mode which allows editing the data pairs in almost any fashion. I felt that this was one of the package's strongest features because you can really roll up your sleeves and manipulate the data any way you want. Pairs can be inserted, deleted, modified or printed as hard copy. There is also a sort routine which will automatically sort data pairs in ascending order of the independent variable if desired.

The graphing function is also versatile. It uses the highest resolution screen to graph the data, allowing you to set up the axes and to display the data points, regression line and 95 percent confidence limits. You even have a choice of five different symbols to use in plotting the data (circles, triangles, squares, etc.). It is also possible to superimpose a grid over the graph if you desire, and you can produce an area graph in which the area below the curve is shaded. Multiple data sets can also be plotted on the same graph.

Labeling of the graph is very easy. The orientation of the text (up, down or horizontal) is selected in command mode and a cursor is used to position the text on the graph. All in all, the package produces a very good-looking graph indeed!

Other functions include transformation of observations using logarithmic, square root, exponential, inverse or additive codes and the calculation, plotting and display of residuals based on the current transformation. *Statgraf* also calculates, displays and sends to the printer a number of useful statistics including a slope, Y-intercept, correlation, confidence limits and tests of significance for each parameter and coefficients of determination and alienation. An interpolation the function calculates predicted values given a value of the independent variable and calculates the 95 percent prediction and confidence intervals for the observation.

I feel this package would be great for the study of regression theory. Things happen fast enough for the student to really begin to spot and analyze trends and see how the theory fits together. But *Statgraf's* main plus is that it is an excellent regression analysis package for anyone who has occasion for serious use of this statistical technique.

(Sugar Software, 2153 Leah Lane, Reynoldsburg, OH 43068, $24.95 tape or disk)

—David Johnson

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Adventure In Wonderland: Alice Is At Least A '9'

You were beginning to get very tired of sitting by your sister with nothing to do. You were considering whether the pleasures of eating ice cream would be worth the trouble of walking all the way to the refrigerator when, suddenly, a white rabbit with pink eyes ran by. There was nothing so very remarkable in that; nor did you think it was so very odd to hear the rabbit say to itself, "Oh dear! Oh dear! I shall be too late!" But, when the rabbit actually took a watch out of its waistcoat pocket, looked at it, and then hurried on, you burned with curiosity. So you ran after it and you were just in time to see it draw a rabbit hole on the TV screen and pop right through it.

In another moment you jumped right after the rabbit, never once considering how in the world you were going to get out. *Down . . . down . . . down.* Then suddenly thump! Fortunately, you were not hurt.

This is where this wonderful new adventure begins. You are stuck in Wonderland and you have three major objectives. You must become Queen, help capture the nasty Snark and, of course, get home again. Don't let the name fool you. It sounds easy to play but believe me it isn't. I consider myself a novice adventurer and so far I have only been able to get home.

The documentation states that the adventure is based on the works of Lewis Carroll. Knowing this, I rushed down to my local library and checked out "Alice in Wonderland." When I got home I was surprised to find out that the adventure followed the book down to the tea. Mad Hatter's Tea Party, that is. The adventure has everything the book has, including the three-legged glass table and even the caterpillar and his hookah.

In most adventure packages you receive a small sheet of paper with a few instructions and a list of verbs. This does not hold true for *Adventure in Wonderland.* When I opened up the package I found a six-page instruction booklet beautifully illustrated. The illustrations made the documentation very interesting, many of them depicting the people and places you will discover. I give Prickly-Pear an A+ on the documentation.

Wonderland is a non-graphic, 100 percent machine language adventure that requires 32K. Unlike most adventures that only understand 30 to 40 words, *Wonderland* uses an "Elize" type intelligence simulator that allows you to carry on full sentence conversations with many of the inhabitants in Wonderland. You can converse with Cheshire Cat, Mock Turtle and many others. This adds to the interest of the adventure.

Cheshire Cat is your constant companion. He has many things to tell you if you tell him the right things. I really enjoyed talking with Cheshire at first, but sometimes when you are trying to move, the cat interrupts with one of his jokes or sayings and you are unable to complete your move. I found this to be very annoying after playing the adventure five or six times.

For those of you who like to kill things, you only have one foe. Because of this, and the fact that you cannot get killed, they should change the name of this program to Fantasy Adventure. Then again, it is Wonderland.

This adventure falls short in only a few areas of being the best adventure. The program does not set up a video window so all room descriptions scroll off the screen. The program also does not allow you to use abbreviations. This means every time you want to move you must type the complete command. One last thing that bothered me about this adventure is that you cannot save it while in progress.

I rate this adventure from difficult to very hard. If you are a real adventure buff, then I recommend this adventure. It may not be *the* best but it is *one* of the best. It is a welcome change from your typical dungeon and haunted house scenarios.

(Prickly-Pear Software, 9234 E. 30th Street, Tucson, AZ 85170, 32K tape, $24.95, 32K disk, $29.95)

—Steven Schweitzer

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Beyond Words Is Beyond Words

EDITOR'S NOTE: While this review was originally run in our September issue, substantial portions were inadvertently deleted during the production process. Following is the review in its entirety.

Beyond Words consists of three separate language arts tutors from Computer Island written for children and young adults, grades three through 12. After *CLOADing* this 32K Extended BASIC program, the user must enter *PCLEAR 1* before proceeding to *RUN*. At this point the student is asked to enter his/her name and tell if the printer is turned on. The child then chooses one of three subtests. Each is a three-part, menu-driven program and the user can practice one skill and then go on to another at the end of a round. The incorrect questions and answers are displayed, and if the printer is turned on, a list of items to study is generated. If a particular subtest is used for five rounds, a total score is given.

Beyond Words 1, 2 and *3* are written for children in grades three to five, grades six to eight, and grades nine to 12 respectively. All have spelling subtests in which a correct and an incorrect spelling of a word is given. The child then types in and enters the word that he thinks is spelled correctly. Fourth graders who tested it really liked the idea of having to type in a word, rather than keying in the number of the answer. That age groups seems to enjoy a program that allows them to use the computer as much as possible.

A second subtest in each program deals with antonyms and synonyms. In this part, two words are shown. The child has to decide if the meaning of the words is the same (S) or opposite (O).

It is the third subtest that is different in each program. In *Beyond Words 1,* it is short forms. This subtest covers abbreviations and contractions. The long form is given and dashes are shown to indicate the length of the answer. The child is then to type in the short form. In *Beyond Words 2,* there is a subtest in homonyms. A word is given, and again dashes indicate the length of the answer. The child has to at sounds type in a word thexactly like the given one.

Beyond Words 3's third subtest is analogies. Two pairs of words are given and the user has to decide if the relationship of the first pair is the same as the relationship of the second pair. In other words, is the analogy true (T) or false (F)?

All three programs have 400 questions each. The questions are randomly selected and, in our testing, we found hardly any repeats with each loading.

The words used in the program are all contained in *DATA* statements. The documentation suggests that the program can be modified by the user and gives very complete directions on how to change the *DATA* statements so the program's use really becomes infinite. The modification directions are clearly written and very easy to follow.

We had many children of all different ages use the program that was suited to their particular age group. The reactions and comments about the programs were all very favorable. All of the children, especially the younger ones, enjoyed the amount of interaction that they had with the computer. My daughter, Shari, who is in the eighth grade, found the subtests for her level very challenging. Very often she complains that "educational" software written for her age group is too easy.

I was glad to see a program written for the high school level. The types of subtests given here would certainly supply excellent practice for the standardized tests that many high school students have to take, such as SATs.

Beyond Words 1, 2 and *3* are excellent language arts tutors. They cause children to think. What more need be said . . . I am beyond words.

(Computer Island, 227 Hampton Green, Staten Island, NY 10312, tape $19.95 each)

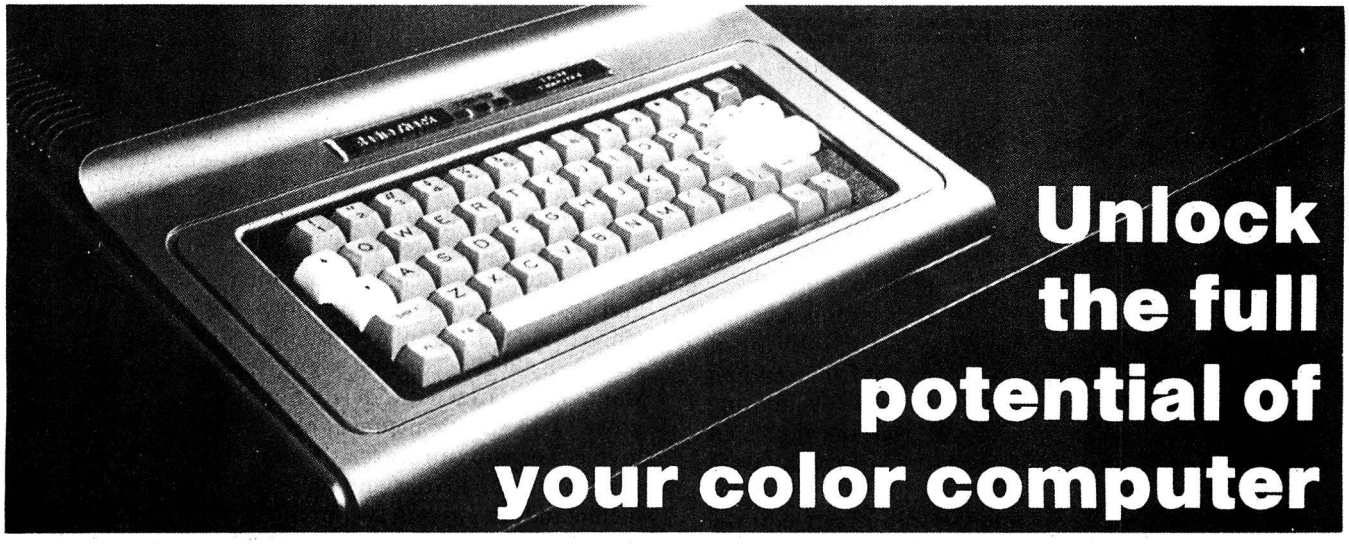
—Stephanie Snyder



Hint . . .

Slow Scrolling Through Orange

Here's a powerful little *POKE* that will slow your scrolling by creating a horizontal *LIST*. Type *POKE* 359,60 and you'll see what we mean. Add a colon (:) and *SCREEN*0,1 and you'll be slow-scrolling across an orange screen. To return to the green screen at full tilt, just type *POKE* 359,126.



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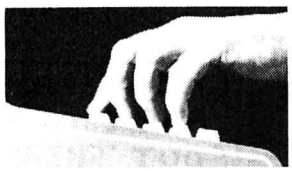
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Spill-proof contacts	Yes	No	No
RFI/EMI shielding	Yes	No	No
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Payup And *Payout*: Some Strengths And A Few Weaknesses

By David Johnson

Payup and *Payout* are new tape-based accounts receivable and accounts payable packages from Sector Software of Canada. Written by Warren Wagner for the CoCo and an LP VII, both programs offer a number of useful accounting functions, but *Payout* (accounts payable) has one fault that I, as an accounting teacher, find very hard to live with. More on that later—first, the good news.

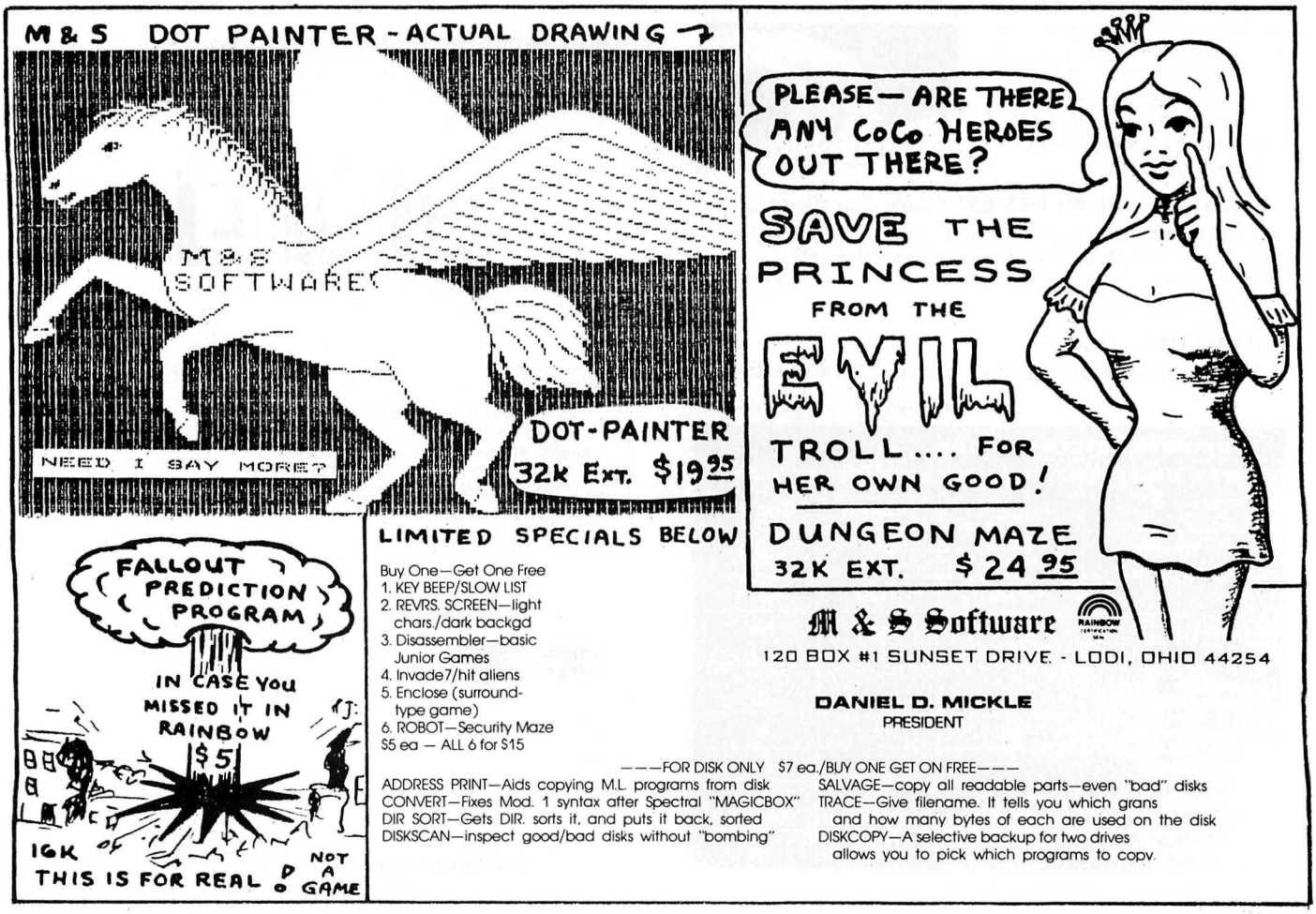
One strength is the author's invitation to freely edit the programs to tailor them to your particular needs. In some places, this is necessary as well as desirable.

Given the inherent limitations of a tape file system, these packages both are fairly easy to learn and operate. Before *LOADing* it is necessary to execute a *POKE 25,6:NEW* in order to clear all available memory. When I failed to do this I got an OM Error when I tried to run the program. After this, *POKE* and *CLOAD* will load a short cover program which, when run, loads the main program while a title screen is displayed. This all seems to take a little too much time to my liking. The loader program can be skipped by positioning the tape and *CLOADing*. This saves some time. During processing, the speed-up *POKE* is used. If your machine can't handle this, you can edit it.

A main menu, which is the same for both programs, is the first thing you see when you run the program. The first function is start or add to files and is the basic data entry function. Information is entered pertaining to receivables and payables invoices such as date, customer or vendor name, invoice number, amount and whether paid, not paid or a credit memo. *Payup* also allows entry of labor charges and sales tax amounts, while *Payout* will ask which asset or expense account to charge the expenditure to. Twelve asset and expense accounts are provided. Nine are already named while the last three are only numbered. Editing the program would easily give you any twelve specific account titles you want. The search, edit, delete function is fairly self-explanatory. The search menu allows a fast scroll through all invoices or you can search through the files by customer or vendor name, invoice number, paid, not paid or credit memo and, in *Payout*, by the check number which paid the invoice. The search-by-name function allows use of partial names. If you don't know the complete name of a vendor or customer, you can still find the invoice.

Selections 4 and 5 on the main menu are the load-from/save-to-tape functions. I encountered no problems here other than the usual limitations of sequential access files. A nice feature here is the ability to load blocks into memory on top of each other without disturbing any files already in memory. This removes some of the sequentiality of the files. It also lets you save separate daily or weekly blocks of data and put it all into memory for processing at the end of the period. With a 32K machine, you have room for 200 files in memory at any one time so space is limited.

Main menu selection 6 is the print statements function



and differs slightly for each program. In both programs, screen output is limited due to the limited space available on the screen. However, the screen statements do offer useful account summaries for intra-period perusal. The screen and printer provide the same basic statements; the screen statements are just more condensed.

Both programs provide good looking, well-formatted output. Double-size letters are used for headings, which can include your company name if you edit it into the program. Instructions for this are provided.

Payup offers a summary of the accounts receivable balance which lists the current period's activity by invoice with debit, credit and balance columns, a complete listing of all invoices in memory indicating amount and whether paid or not paid and statements of account by customer. There is also a sales tax statement but some program editing will likely be necessary here to reflect specific tax rates and vendor's commissions.

Payout's statements are similar to those generated by *Payup*. There is a balance sheet by invoice with debit, credit and balance columns, a listing of all invoices in memory indicating amount and whether paid or not (The title of this statement is "List of Receipts"; I feel "List of Charges" would be better.) and a listing of any or all of the asset or expense accounts showing their balances and listing the invoices that make up those balances.

It is in *Payout's* balance sheet where there is a problem. When an invoice is entered, the amount is correctly debited to the selected asset or expense account, but is also debited to the accounts payable account. Similarly, a credit memo from a vendor is properly credited as far as assets or expenses are concerned, but it is also credited to accounts payable. Payments of invoices are also credited to accounts payable. What this means is that the accounts payable account is exactly in reverse, that is, the debits should be credits and vice versa. I have not been able to determine as yet how difficult a fix this would be in the program, but I do feel it is a serious problem. In accounting, debits are debits and credits are credits and must be handled with the least possibility of errors. One could ignore the debit and credit columns and just use the balance, but I feel this just increases the chances of an error occurring when the primary financial statements are prepared.

Except for the complete listings, the statements can only be printed on a monthly basis according to invoice date. All balance calculations are performed when the statements are printed so you must keep up with previous balances as of particular dates (the program will ask for the previous balance) should you want statements printed on intra-period dates. This might require a subsidiary paper file.

The documentation for the program is enough to get you started, but it is somewhat sketchy, offering only brief descriptions of the functions and some statement examples (without explanations). Instructions are provided for changing the program to fit a 16K machine, but you really need 32K for any real quantity of data.

Overall, there is a good beginning here, but I feel more work is needed. If you plan to buy this one, be prepared for a thorough testing period before you go on line.

(Sector Software, 17 Waynewood Drive, Dartmouth, N.S. B2W 1G1, Canada, $29.95 each on cassette)

Score-EZ Is Easy

Jarb Software's *Score-EZ* is a great game for the CoCo. It is a version of the home game Yahtzee, where you try to make the best poker hand out of five dice in three rolls. This version is for one to six players, each one having their own score pad on the screen. The CoCo does all the work: it rolls the dice and keeps score. All you do is pick the dice you want to keep and roll the rest, and if you get what you want before your three rolls are up, you can skip the rest of your rolls and go right to your own score sheet.

The game starts with some simple block graphics that spell Score-EZ. I like the game instructions and the write-up that came with the game. They were "ez" to understand and it was "ez" to play the game. The game is written for 16K Extended BASIC.

The only aspect I didn't like was the double entry prompts: you always had to key what you wanted and then hit ENTER. This confused people at the start, but as the game progressed it was no longer a problem.

Have fun, and may all your rolls be good ones.

(Jarb Software, 1636 D Ave., Suite C, National City, CA 92050, tape $15.95)

—Stephen M. Hess

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AMDISK-III
Small Drives, Big Byte

I was a little apprehensive, to say the least, at the first sight of the new *AMDEK* 3″ disk drives. Why would anyone want a 3″ disk? My 5¼″ disks are almost full and surely a 3″ disk can't hold that much! Wrong! Measuring approximately 7″ wide x 4½″ high x 8½″ deep, the *AMDISK-III* disk drive will hold more.

The first thing I did when trying out the new drives is format a 3″ disk at 40 tracks/18 sectors using *FLEX*. That's 184K compared to the normal 161K. Since the *AMDEK* disks are two-sided, a total capacity of 368K per disk is very realistic. Due to the fact that Disk Extended BASIC initializes disks at 35 tracks and 18 sectors, the total capacity of each disk is 322K including the directory. The 3″ disks are very rugged and ideal for mailing or carrying around in your shirt pocket. A metal shield covers the media when not in use.

Each *AMDEK* package has two drives housed in an attractive gray and off-white enclosure. The unit is shopped with two diskettes and comes ready to operate. The owner must supply the Radio Shack disk controller. Two choices of cables are available, depending on whether one or two 5¼″ drives are to be used in addition to the *AMDEK* unit. The 5¼″ drives are necessary only for compatibility with existing software packages as the 3″ drives can be operated as a stand-alone disk system. This drive system can be configured to be either drives 0 and 1, or 1 and 2. Adequate instructions, complete with pictures, are given regarding setting the switches complete with pictures.

If an existing Radio Shack drive is used for drive #1, the user is given instructions for removing the termination resistor inside the drive. This resistor is supposed to terminate the last drive on any "daisy chained" system. Since the *AMDEK* drives already contain a "termination" resistor, it is no longer necessary and may even degrade the system operation.

The key specifications of the drives follow:

Average Access Time	— 55 msec
Track to Track	— 3 msec
Settling Time	— 15 msec
Average Latency Time	— 100 msec
Motor Start Time	— 0.7 sec

Specifications for the standard Radio Shack drive list the average access time as 463 msec. As you can see the *AMDEK* drives are much faster. This could become an asset with the new OS-9, system as driver characteristics are programmable. With the frequency of disk operation, a true DOS speed is important. Also, 40-track drives are supported.

With the exception of a fan that runs continuously, the drives are very quiet. A front panel switch turns the power on and a welcome pilot light reminds you to turn it off. The unit is designed for two-sided disks and a pilot light on each drive is either red or green depending on the side in use. Sometimes the light is the only indication that the drive is running due to the enclosed nature of the disk aperture.

The unit was tested both with and without a 5¼″ drive in the system and performed just like you would expect. To the user, it is just like having two regular sized drives on line. In reality, I don't see how you could survive without at least one 5¼″ drive in the system. However, a dozen or more software vendors *will* provide software on 3″ disk, if requested—among those being Frank Hogg Labs, Tom Mix, Nelson Software and Cognitec. Still, you must have some way of reading other commercial software. Once this software is transferred to the 3″ disks your problems are solved.

I am very pleased with the operation of *AMDEK-III*. After about a week of use, no problems were encountered other than normal operator error. It is just like having two 5¼″ drives. In fact, it is even better since each disk had two sides.

(AMDEK Corp., 2201 Lively Blvd., Elk Grove Village, IL 60007, $499)

—Dan Downard

Hint . . .

No-List *POKE*

If you would like to keep your program from listing, use *POKE* 383,158. To return to normal listing, type *POKE* 383,0.

Ken Ostrer

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32K TRS 80 COLOR Version $24.95.
Adds a second level with dungeons and more Questing.



WIZARDS TOWER – This is very similar to Quest (see above). We added wizards, magic, dragons, and dungeons to come up with a Quest with a D&D flavor. It requires 16k extended color BASIC. 13k VIC, Commodore 64, TRS-80 16k Extended BASIC, TI99/A extended BASIC. $14.95 Tape, $19.95 Disk.

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(by Rodger Olsen)
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This is our most challenging ADVENTURE. It is a treasure hunt in a pyramid full of problems. Exciting and tough!



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Dungeons of Death – This is the first D&D type game good enough to qualify at Aardvark. This is serious D&D that allows 1 to 6 players to go on a Dragon Hunting, Monster Killing, Dungeon Exploring Quest. Played on an on-screen map, you get a choice of race and character (Human, Dwarf, Soldier, Wizard, etc.), a chance to grow from game to game, and a 15 page manual. 16k Extended TRS-80 Color, 13k VIC, Commodore 64. At the normal price for an Adventure (14.95 tape, $19.95 disk), this is a giveaway.

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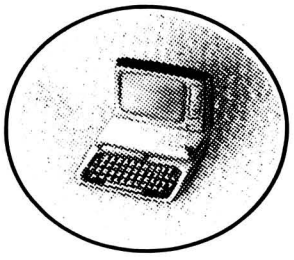
For all of you would-be typists who, like me, could use a hand keying in BASIC programs, there is an updated version of a BASIC enhancement package appropriately called *Master Control II.* This machine language program is designed to allow you to easily enter most BASIC commands and keywords with only two keystrokes.

The complete package is very professionally done and includes a 1616 byte program on a quality cassette with a plastic keyboard overlay and a well-written, six-page instruction manual. The program, as supplied, requires a minimum of 16K and although Extended BASIC is *not* required, some of the BASIC statements that can be entered via *Master Control II* are for Extended BASIC only. The software is also compatible with the Radio Shack disk system.

Upon getting the program, I proceeded in my typically precise manner, *glancing* at the instructions and immediately loading *Master Control II* on my 32K CoCo. I then loaded a rather large program that I had never finished, with the intention of utilizing the software to its fullest. Well, to make a long story short, about a minute later I got a very "interesting" graphic display of random colors and a CoCo that refused to respond to any keyboard input. A second, more detailed examination of the instructions disclosed the problem. It seems, obviously now, that if you have more than 16K or a disk system, you must first make a copy of the program, adjusting the start, end and exec addresses prior to actual use.

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Once loaded, *Master Control II* lives up to its promises and allows you to enter BASIC commands and statements with only two or three keystrokes. Some of these commands such as *RUN* and *CONT* take effect immediately without need for the *ENTER* key. Others, such as *LIST* and *SAVE* allow you to enter specific line numbers and program names respectively. Normal BASIC statements such as *PRINT, FOR* and *PEEK* will also be printed with only two keystrokes.

This shorthand method of entering BASIC programs can be very helpful. In fact, the program's effectiveness seems to be directly related to one's typing ability. In other words, the lower your typing ability the greater your possible improvement in throughput.

Another very convenient feature of *Master Control II* is the automatic line numbering option. This allows you to specify the starting line number and increment or default to 10,10. For entering your own programs this feature is a must. For entering programs from a magazine such as *the Rainbow* you are at the mercy of the original programmer. If he or she was kind enough to number the program in a consistent manner with a fixed increment, you are in luck. Otherwise, automatic line numbering will just not suffice. Also, there is one important point not covered in the instructions. Once in auto mode you will naturally continue to be provided with the next line number whenever you press *ENTER.* However, should you want to exit the auto mode to correct a mistake, etc., the instructions provide no help. Trial and error disclosed that pressing the Break key temporarily exits the auto mode. Returning to auto line numbering is as easy as pressing "shift-down arrow" and the key marked *AUTO.* The program will then pick up where you left off in the numbering sequence.

Master Control II also provides a repeat function on all keys and one programmable custom key. The custom key works fine and I only encountered one minor problem when using it. A couple of keystrokes put you into the enter mode for the custom key. You then enter whatever you wish your custom key to later repeat. Being ambitious, I attempted to program my custom key with four or five lines of information. As usual, my nimble fingers couldn't keep up with my thinking and a typo resulted. Pressing the "left-arrow" to backspace and correct my mistake, I found the left-arrow doesn't backspace, it just prints a lowercase "h"! Picky, I know, but when your wife is looking over your shoulder, impatiently waiting to use your wonderful new program, time is critical and rekeying the whole thing is frustrating.

To continue, one feature I found missing from this otherwise good program, was a full screen editor. *Master Control II* is great for entering new programs. However, for making changes to existing text, you are still stuck with Radio Shack's less than adequate built-in editing capabilities. A couple of years ago when *the Rainbow* was just a newsletter, I bought a full screen editor (yes, Virginia, there *was* software available even then). I still use this editor today and truthfully could not live without it. Unfortunately, it is not compatible with *Master Control II.* Oh, well!

Summing up, if you want a good program to enable you to enter BASIC programs more quickly and correctly, would like automatic line numbering and a programmable custom key and don't mind the CoCo's built-in editing capabilities, then this software package could very well be for you.

(CoCo Warehouse, 500 N. Dobson, Westland, MI 48185, $19.95)

—Ken Boyle

FINALLY!

A REAL SPREAD-SHEET PROGRAM FOR THE COLOR COMPUTER

DYNACALC™

Business people use spread-sheets to organize columns and rows of figures. DYNACALC simulates the operation of a spread-sheet without the mess of paper and pencil. Of course, corrections and changes are a snap. Changing any entered value causes the whole spread-sheet to be re-calculated based on the new constants. This means that you can play, 'what if?' to your heart's content.

But DYNACALC isn't just for accountants. DYNACALC can be used for just about any type of job. Not only numbers, but alphanumeric messages can be handled. Engineers and other technical users will love DYNACALC's sixteen-digit math and built-in scientific functions. There's even a built-in sort command, so you can use DYNACALC to manage small data bases - up to 256 records.

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Except for a few seldom-used commands, DYNACALC is memory-resident, so there is little disk I/O to slow things down. The whole data array (worksheet) is in memory, so access to any point is instantaneous. DYNACALC is 100% 6809 machine code for blistering speed.

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SEAL

The *Mouse* Stands Alone

Radio Shack has again shown its continued support of the Color Computer with its introduction of another hardware item, the *Color Mouse*. This little gem will allow you extremely fast and easy control of cursor movement in any direction. The *Mouse* is very compact in size, 3½" long, 2½" wide, and about 1½" high. The fire button is located on the top front of the unit. It is very easy to position your finger on it while moving the *Mouse*.

You can use the *Mouse* with or without joysticks. To use it, simply plug it into one of the joystick ports (the program you are using will determine which one) and set it down on a piece of clean paper. The reason for this is to prevent the ball on the bottom of the *Mouse* from picking up any foreign matter. The movement of the *Mouse* is very smooth as long as you keep the ball clean.

The surface area that the *Mouse* uses is approximately a 5" square. Cursor direction is relative to the position of the *Mouse* on the paper. When you move it away from you, the cursor will move to the top of the screen. To bring the cursor to the bottom of the screen simply move the *Mouse* toward you. Any direction is available to you by simply moving the *Mouse* to a position that is relative to the starting point you chose on the paper.

I have found that you can use the *Mouse* on virtually any game, or with any program in which you want precise control of the cursor, such as drawing graphics. It does have its drawbacks though, with certain types of games. These games would include *Pac Man*, and maze-type games, where cursor control is limited to direct horizontal and vertical movement.

All in all, the *Color Mouse* from Radio Shack is a good hardware item to expand the versatility of your Color Computer.

(Radio Shack, Nationwide, Cat. No. 26-3025, $49.95)

—Ted Hasenstaub

Motorbike Challenge Provides Cheap Thrills

As you accelerate on your motorcycle you see an obstacle in your path. Your choices are to jump over it or crash through it and die. Naturally, you jump over and make it with ease. No, you're not in a James Bond movie with a souped-up cycle, you're playing *Motorbike Challenge*, a new game for your TRS-80 Color Computer or TDP-100.

Motorbike Challenge is a 16K Extended BASIC game which is in machine language. Extended BASIC routines are used for graphics. The game uses the right joystick for control of the motorbike.

The objective of the game is to cross obstacles and the bomb-ravaged bridge while exercising full riding controls. It is a challenging game for those who seek adventure in a motorbike ride. The computer asks you to pick a skill level from 1 to 9. The computer displays side views of the two tracks, the bomb-ravaged bridge, the water, obstacles and your motorbike. The number of motorbikes in reserve is indicated by the number of dots at the top left-hand corner of the screen. You are given three chances to complete the course. Each time you finish you get a more difficult course.

The instruction page for *Motorbike Challenge* is very good. It tells you everything you need to know about the game. This includes loading instructions, skill levels, joystick controls and score display.

There seems to be a problem with the color mode selection. Sometimes the color set is reversed after loading the program. The water, normally blue, turns red.

I recommend this program for your home use and, at $14.95, it's a steal.

(Microcom Software, P. O. Box 214, Fairport, NY 14150, $14.95 on tape)

—Pat Downard

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Math Adventure Could Be An Educational Treasure . . .

I am alone in the middle of a deep, dark cave. There is no possible way for me to escape. There is a wall to either side of me, blocking both my exits, and nestled between them is a strange looking box. Since I have had my troubles with strange looking boxes, (my CoCo is one of them) I decide to take my chances at one of the walls. I charge the large red wall, in full barbaric fashion, and at the instant I crash into the wall, it mercilessly groans (walls do not speak, they either groan or squeak) my one weakness, *a math problem*! I now stand at the wall, trying to figure out what the product of 177 and 165 is. (This is a real head scratcher, even for us barbarians.) Luckily, the Barbarian Horde Local 101 has given us behemoths calculators. However, since it is good for people to learn to do these mathematics in their head, a new release by The Software Factory allows your youngster to go on an adventure while learning math problems.

The program is called *Math Adventure,* and is intended for educational purposes, and requires a 32K Color Computer with Extended Color BASIC. The program pushes the memory constraints of a 32K machine, so it will not work with the disk drive ROM Pack plugged in.

When the program first loads in, you are greeted with the copyright notice, and are asked the skill level that you wish to select (between one and 20). The accompanying documentation explains that for each level selected, random numbers of up to twelve times the level selected are possible (ie, level 20 would have numbers up to 240).

The program then asks how many screens are desired. The number selected may be in a range of 10 to 60. This number really decides the length of the game. Playing the "quickest" game (10), I could not keep the time to complete the game under the hour mark. This is definitely the program's most serious stumbling block. Since this program is geared with the 6- to 12-year-old in mind, it tends to fail because of loss of interest. From the number of children that age I have seen, I cannot imagine very many of them sitting still for more than 15 minutes, and none of them would for an hour to hour and a half *minimum* of this program.

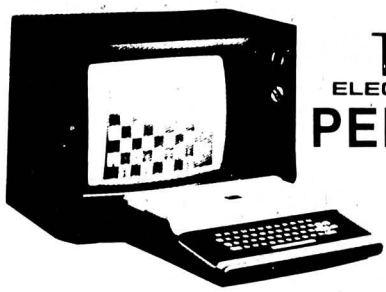
After selecting the number of screens, the program loads data off the cassette, and squeezes memory to less than four hundred free bytes. The program asks you to select what type of questions are preferred. You may select addition, subtraction, division, multiplication, or all four of these at the same time.

Finally, a nice feature is included. The program asks you if your machine can handle high speed. I really do appreciate this feature in programs, because my machine does not handle the high speed well, and I do not enjoy editing the program to take out the high speed *POKEs*. Unfortunately, the program and the documentation assume that most Color Computers *can* handle the high speed, and as a result, it appears as if little effort has been taken to speed up the graphics. The program takes anywhere from 10 to 23 seconds to draw the graphics. Since this is definitely a nuisance, I cannot see why the author did not speed up the

ALMOST UNBELIEVABLE!

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graphics, especially when many of the screens repeat themselves. Why couldn't the program simply use the same screen instead of re-drawing the whole screen? Another complaint about the speed could be fixed by simply not using a ridiculous order of operations to paint the screens. As an example, when on the "forest path" area, the program uses BASIC's *PAINT* command. There is no problem with this, but it is used in an illogical order. The program clears the screen green, then draws a large portion of the screen blue; then it draws "trees," which are quite larger than the sky area, and again paints them green. This is at best an awkward way to do graphics, and takes extra work.

The program does add some good features in the graphics area, which does make *Math Adventure* more interesting. First, there is the boat. The student may enter the boat by correctly answering a question, which adds a nice dimension to the game by showing the player's figure in a small raft-type boat, which makes the game much more enjoyable.

The program also displays a bright red box, which acts as a teleporter in full Star Trek fashion. When the student touches this box, he is asked a math problem, and if he answers correctly is teleported to the cave level. To return to the "path" area you must re-enter the teleporter. I really like the way you are "beamed aboard," where you are scrambled apart and re-integrated into your more usual self. Although I like this feature, it might be confusing to children that are young, but it must be explained to them.

The object of the game is to gather the 15 treasures, and while this may seem like an easy job, it takes a considerable amount of time. To gather a treasure, all one must do is simply run into the treasure and answer the question that is posed to you. If you fail, the treasure disappears and is randomly replaced in the game area. If you correctly answer, your score is incremented and you are played the three notes that are given for all correct answers.

As far as an educational program goes, this program does not go far. Although it is not intended to teach a student *how* to do math, it *is* intended to be a drill to encourage the student to study math. (Or is that to trick the student to learn math?) The program *does* succeed in this area, but it is not effective because there is not enough action, movement, exciting graphics, sound, or sufficient rewards to keep the child's interest. In other educational programs I have used, there are many more rewards and encouragement; in this program the only reward is a three-note tune. The worst educational aspect of the program is that if you incorrectly respond to a question, you are not given a second chance, or even the correct answer. I thought this was especially poor because the student is trying to *learn*, not guess blindly.

I cannot really recommend this program unless some simple changes are made. This program could, however, be greatly improved *if* the speed of the graphics is increased, and more action is incorporated to encourage the student to play the program. (One idea would be to add an evil monster to stop the student from taking his/her attention off the program.) Also, more chances to answer the question, or the correct answer itself, *must* be given if we are to facilitate learning. If these changes are made, I believe *Math Adventure* could become one of the better educational programs available for the Color Computer.

(The Software Factory, 1333 Morgan Rd., Bremerton, WA 98312, $21.95 tape)

—Eric Oberle

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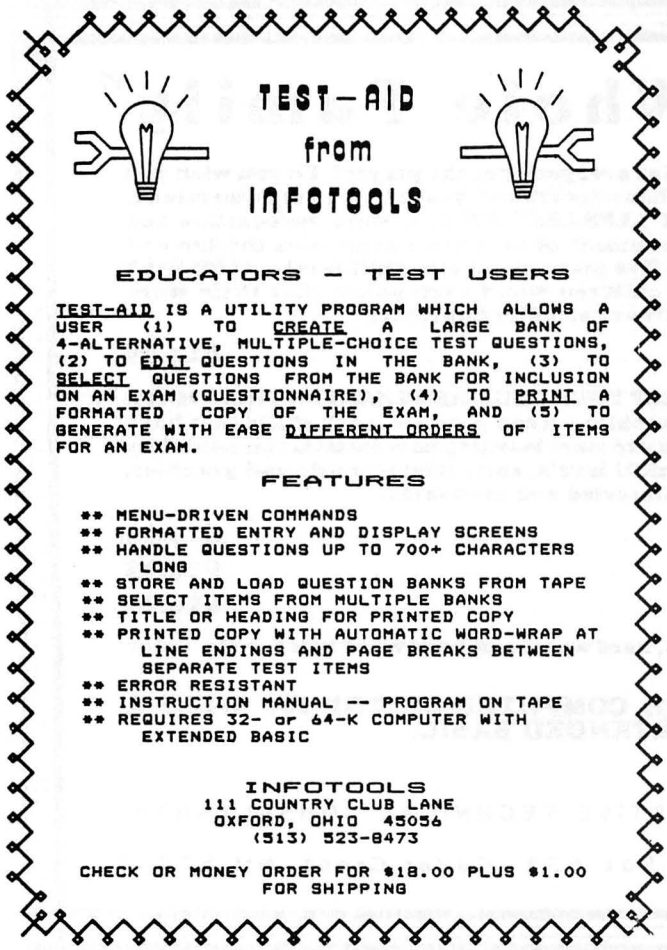
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Super Screen Gives Hi-Res Plus

Most people will agree that our CoCo is a very powerful machine. With 64K and a disk drive or two, you can now run some very sophisticated software. When it comes to running small business and advanced personal programs, however, there is a problem. The normal text screen display is only 32 characters by 16 lines, which limits the amount of data that can be displayed at any given time. Also, there is no easy way to efficiently combine text and graphics on the same screen.

Super Screen is a machine language utility that not only solves these problems, but adds a few additional features to CoCo's repertoire, as well. It requires a minimum of 16K, works with Extended or Disk BASIC, and also works on a 64K machine. The screen is produced in *PMODE4*, and displays 51 characters by 24 lines on a buff colored screen. Any character that can normally be printed on the screen can be printed with this program. Several "control codes" are available to control and customize the display, and the *PRINT@* and *CLS* commands are also fully implemented.

Once the program is *EXECuted, Super Screen* will automatically adjust itself to conform to the amount of memory that you have. There is also no need to reserve space for it beforehand, or to enter any exotic *POKEs*—a very nice touch. At this point, you are presented with the familiar OK prompt, except that you are working on a hi-res screen.



There are nine control codes in all, and they are passed to the program with a "PRINT CHR$(N)" statement, where "N" is the control code. The codes perform the following functions: reversing the screen characters and background color; backspacing the cursor; issuing a line feed; issuing a carriage return; switching between a blinking or non-blinking cursor; issuing a home-up; erasing from the cursor to the end of the line; and erasing from the cursor to the end of the screen.

Using the control codes is very easy, but I soon got tired of typing in all those "PRINT CHR$(N)" statements. I solved this problem by equating my own variables to the control codes I was using. For example, I set RV$ =CHR$(6), and was able to reverse the video by using a "PRINT RV$." This also made it easier to remember the control codes. I also discovered that a *SCREEN1,0* command will change the color set to green instead of buff. This produced a slightly more readable display on my color TV due to the pseudo-colors produced on the normal buff screen.

Super Screen has two additional features that make it more than just a screen utility. The first of these is the auto key repeat, which will repeat any key that is held down for more than one-half second. This made it very easy to edit long BASIC lines when holding down the spacebaar or left arrow keys, for example.

The other additional feature is the real kicker. It is a full implementation of the *ON ERROR GOTO* command, which is found on some other machines. With this extremely handy command, you can trap any error in your program and stay in control as opposed to having your program go down the tubes. You can also find out exactly what the error was, and in what line number it occurred. This feature can be a real lifesaver if you have spent an hour or so entering data into your program, only to be greeted with an I/O error when you try to save your data out to disk or tape (without a disk in the drive for example). Remember, if you *RUN* your program after an error, all of your data will be lost.

Super Screen is an excellent utility that performs very well, and is designed with both business and personal users in mind. Because of this, it will only work in *PMODE4*, which might be a limiting factor for some users. The documentation clearly explains how to use it, and includes many helpful examples. One additional feature of *Super Screen* is that it is supported by very friendly and helpful people, which is a must for the serious CoCo user.

(Mark Data Products, 4001 Alicia Pkwy., No. 207, Mission Viejo, CA 92691, $29.95 tape, $32.95 disk)

—Gerry Schechter

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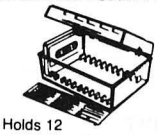
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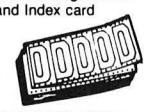
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Fast-Paced *Fury* Has Good Color, Graphics

Fury, an arcade-type game from Computer Shack requiring 32K Extended Color BASIC, has some extremely good graphics, but the sound effects could use some improvement. Let's look at the high points first.

As the game begins, you are in an airplane surrounded by clouds and enemy aircraft, including helicopters, airplanes, hot air balloons, parachutists and deadly magnetic mines. Using joysticks, your goal is to destroy as many enemy craft as possible before colliding with any of them. Your ship remains at the center of the screen at all times, but the graphic effects are such that you appear to move around through the clouds and enemy craft.

The game is fast-paced, colorful, and responds rapidly to the joysticks. *Fury* can be played with up to two players. The game becomes more difficult as it progresses and your score increases. This is done by releasing more magnetic mines into your airspace and decreasing your firing rate as your cannon heats up. The magnetic mines are a nice touch, as they are indestructible and you must run from them as they chase you if you get too close. You get three aircraft initially and can earn another for each 15 enemy airplanes destroyed. The parachutist cannot be shot, but must be rammed by your craft to be destroyed.

The enemy craft seem to randomly move across the sky in different straight-line vectors, and your manipulation of the joysticks alters the perception of their direction, giving a very good, flickerless illusion of movement on your part. There are enough enemy aircraft in the sky at all times to keep you busy firing and dodging the mines.

The game's weakest point is in its sound effects. It has "talking" capabilities and the novelty and cuteness of the speech synthesis quickly wears thin. It announces its title and publisher periodically during the attract mode and prompts the players for their turns (even in a single player game). I think it's wonderful that people are gifted enough to program speaking ability into the CoCo, but I also believe the speech generated should contributed to the quality of the game, and not distract from its playability, as it seems to do in *Fury*. The firing sound effects are done nicely with a realistic machine gun sound, but when your ship is destroyed all you get is a weak sounding, ineffective low volume sound distortion.

I prefer seeing the memory space allocated to speech synthesis devoted to giving the game multiple skill levels. As it is, the game starts at a quite difficult level for the younger child and continues to increase in difficulty, especially when the firing rate is slowed down. Our eight-year-old lost interest rather quickly.

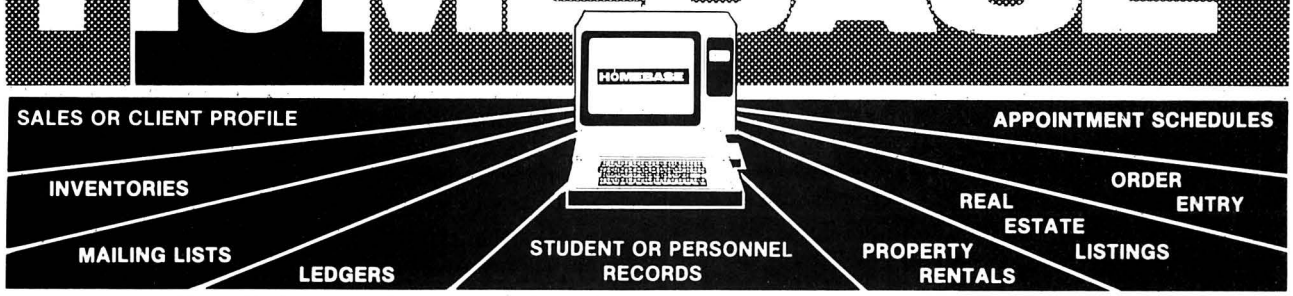
Fury is also available for 16K with sound effects but without voice synthesizer.

If you appreciate good, smooth graphics and don't mind a rather irritating voice reminding you it's your turn, then I can recommend *Fury*.

(Computer Shack, 1691 Eason, Pontiac, MI 48034, tape, $27.95, disk $29.95 for 32K with joysticks)

—Randall Smith

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Color Monitor
Help For ML Programmers

Attention Color Computer Wizards! Not the Dungeons and Dragons type of Wizards, but you Wizards who are *into* CoCo machine language programming. Tom Mix has released a program to help you in your quests for the ultimate program.

Color Monitor allows the user to edit and debug machine language programs for the 80C. After the program to be monitored and the *Color Monitor* programs have been loaded, you can choose from a series of commands which allow you to:

—Display Memory — One line, eight bytes long.
—Substitute Memory — Displays a line with the option of substituting a new byte for the current one.
—Jump to a specific address and execute the program to a user-specified address.
—Move a block of memory from any location to any location.
—Display the contents of any register.
—Change the contents of any register.
—Exit *Monitor* and return to BASIC.

Color Monitor occupies 1174 bytes of memory so it is usable with most 32K programs. Since it is written in position independent code, it can be moved out of the way of your machine language program. Memory is displayed in hex and ASCII format on one line, eight bytes long.

Color Monitor is easy to use. Machine language programs reveal their secrets and bugs as *Monitor* enables you to review them. Even ROM packs can be analyzed by disabling the auto start mode by covering pins 7 and 8.

A feature which would make the unit more desirable would be a single step (jump to PC, *EXEC*, next instruction and BREAK) command.

My other objection is the format of the instruction manual (if it can be called a manual). Like other Tom Mix software, all instructions, hints and info are printed on a 5½ x 5½ sheet of paper. While this format might suffice for *The King* or other games, it just is not adequate for a program of this complexity. A larger format or more pages would allow for more detail and larger type.

With the current documentation, this program is only for those who know what they are doing. No beginners allowed here.

In conclusion, if you are *into* machine language programming, you'll like *Color Monitor* because it allows you to get into your machine language program.

(Tom Mix Software, 3424 College N.E., Grand Rapids, MI 49505, $24.95 on tape)

—Bruce Rothermel



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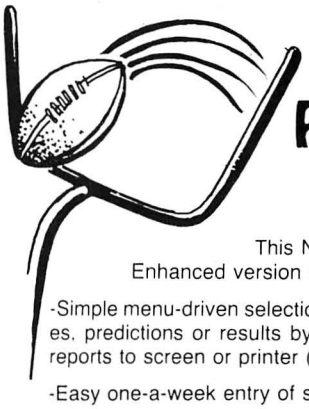
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Kaleidophone — An Array Of Color, Sound And Instruction

Well, here's another color organ-type program for your CoCo. *Kaleidophone* is a very good idea. It will create avant-garde art creations on your computer screen, based on the fanciful flights of harmonious melodies from your sound system.

When you open the box, you are greeted by a very impressive cable that will connect your computer and your stereo. My first questions were answered quickly. My computer is quite a distance from my stereo, and I didn't want to have to move either one. The interconnecting cable is at least 17 feet long—more than ample to do the job. My next concern was connecting my stereo to my computer. I didn't want to make nachos out of my computer chips! So when I saw that little black box on the cable, well . . . I mean what are screwdrivers for anyway? I felt much better to see some guts in that box. It looks as if it should take care of most of the output, and maybe a spike or two.

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So, with computer and stereo hooked up, I marched on to the instructions. This is where some real fun starts! Contained in the documentation is a mini-adventure. Your first task is to pick from one of three pamphlets containing the information to get started. I'll give you a clue—go to the single sheet first. Now you have the knowledge you need for "Quest Of Color."

The second of the three scrolls is to throw you off track. It is called "Installations and Operating Instructions." This will prove to be no major form of enlightenment. Mainly, it's a test of determination. Now cautiously proceed to *Kaleidophonics 1983*. You have now reached your goal! Marvelous color displays on your computer's screen! Well, gang, get ready for a surprise.

All through your *Quest of Color* you were told of the wonderful potential of this software/hardware combo. And, basically, they are right. This setup has lots of potential. But, right now, your awesome display of "Night on Bare Mountain" stays in a sea of potential.

The demo program included is a very valiant attempt to show some nice features. But mainly they only suggest to you what can be done. The only routine that gets close to giving you a choreographed display is *Fly*. In my opinion, this is the only thing that lives up to all the claims of an interesting display coordinated with the movement of music.

As we move deeper into the documentation, you find more riddles and clues as to what can be done. In section III, you have the strange feeling of entering into the middle of this odyssey. You see familiar but unrelated information. In an attempt to get a bearing on where you are, you move on to "Calling Machine Language Utilities."

Here you find a thick web of information—all interconnected but separate. You learn of eight ML routines. Their faces are never shown. You are told to experiment with them, but, all the time the object code remains a secret. Thus, creating another creature swimming in the sea of potential.

So far this review has been very fanciful. This is the same feeling you get when you read the documentation. The aura of having something grand and unique. The feeling of approaching a new vista in art and music. But, with every dream comes the time to wake up.

Kaleidophone is a very nice package. And it comes with some good software and a fully detailed manual. If you would like to create your own ultimate color organ, this is the stuff you need. But, if you want to buy something that you can grasp onto quickly, and be really impressed with your efforts, hold on. The people at New Salem Research did a good job on the hardware. There are also some nice ML routines. But, if you want a really good display, be prepared to work at it. I feel the results from that effort could be very rewarding.

If, after reading this review, you are left with the feeling, "What's he talking about?" don't worry. This is the same feeling I got when I finished reading the documentation. Should you buy it? If you want a system to create your own ultimate color organ, then *yes*. If you want something pretty to look at, Tandy's *Audio Spectrum Analyzer* is very good.

(New Salem Research, West Main Street, New Salem, MA 01355, $49.95)

—Walter V. Seay

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First Sampler: The Good, The Bad And The Ugly

By A. Buddy Hogan

First Sampler is a cassette package of six BASIC programs that "have been published in popular computer magazines." The documentation for the six programs consists of a copy of the full page ad that Dataman uses to promote its business. The description of each program is extremely brief and nondescript. Each program, then, becomes an adventure in itself. There are three consecutive copies of each program on the tape. I presume they are recorded at different volume levels, but the first recording of each loaded fine for me.

WORD. Up to 10 people can play this electronic version of the popular board game, Scrabble. Each player's name is displayed at the top of the screen as each round is played. There are 10 boxes with randomly generated letters that you must use to form a word. The score for each letter chosen is displayed as is the total value of the word. After the word is entered, you are asked whether the word is correct. This is intended to allow time to look up questionable words in the dictionary. A "yes" results in your score for the round being displayed and lets the next player take a turn; a "no" allows you to use the arrow keys to redo the word. The game lasts for as many rounds as it takes to use up the 200 letters alloted for a game. The program uses *DATA* statements to insure that consonants and vowels are available for each player's turn. This game is fun to play and educational as well.

MATH. There are no instructions for using the program, but it is relatively simple to follow. You are given a choice of the math function you want to practice, or you may choose a combination of the four. You are confronted with 10 problems that are cleverly presented in boxes with randomly colored backgrounds. One mistake on each question is allowed before you are given the correct answer. If you solve the problem, you are congratulated and the problem is erased from the box; if you miss it twice, a sad tune is played, the correct answer is given and the problem remains in the box so you can see which ones you have missed. If you hit an alpha key rather than a numeric in attempting to answer a problem, a "?Redo" is written on the screen between the lines used by the program. It will remain for the rest of the round. The level of math presented is approximately sixth grade (three place addition and subtraction, two place division, and three place multiplication). However, I must caution you, I would not allow a sixth grader, or anyone else, to come close to this program. I suggest that this program be erased immediately by anyone purchasing *First Sampler*. You are advised by the ad copy that this program will "improve your mental math skill." What they neglect to tell you is that your mental math skill improvement may occur at the expense of your overall mental health. I had an extremely difficult time reviewing this program and the ones that follow because of the singular manner in which the programmer has abused the first commandment of programming, "Thou shalt not use the computer to ridicule, belittle or demean a human being." A computer program that is intended to help a person sharpen academic skills should employ sound teaching techniques, not pomposity. At the conclusion of each round, you are presented with your score (0-100 percent) and a pompous message that is dictated by the level of your score. If you miss all of the questions, you get this jolly little message: "You must have jello for brains." A 10 percent score produces, "I know morons that score higher." If that isn't gross enough, guess what your reward is if you score high? If you miss only one you are told, "You can't replace me yet." The praise and encouragement for getting a perfect score is, "I bet you can't do that again." Don Rickles would be proud of this programmer's style. If you can survive the insults, you are informed of the time that it took you (in seconds) to complete the round.

CONVOY. Remember a board game called "Battleship?" Well, *Convoy*, the CoCo version, is better than the real thing. The program makes excellent use of the graphics and animation capabilities of CoCo. The learning value of *Convoy* is worth the price of the entire package of programs. A multicolored display is drawn in the upper left two-thirds of the screen. The display is really a matrix consisting of vertical rows (numbered 0-9) and horizontal columns (labeled A-T). You are asked to enter the row and column for the bow position of a ship. Then you are told to enter the rest of the vessel by pushing an arrow. The vessel is entered on the display as a series of boxes with the first letter of the vessel inside each box. If you try to place a ship off of the screen,

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you are told that your ship is "out of ocean." You are given one aircraft carrier (made up of five boxes), two battleships (made up of four boxes each), three cruisers (three boxes each), two submarines (two boxes each) and four PT boats (one box each).

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The game continues in this fashion until all of one fleet is destroyed. If you fire on a location that contains your own ship, you are told that you have fired on your own ship and you lose your turn. This is an outstanding game in every respect.

BAGIT. Are you always forgetting things? Most of us have that problem. *Bagit* will help you train yourself to remember. You are instructed to try to remember the objects that will be put into a bag by creating a mental image that connects the objects or the first letter of each object. This is good advice. Up to six players can play. Each must decide how many misses will be allowed before the player is eliminated. This allows people of different skill levels to play together.

A screen is presented that has a "bag" drawn at the bottom with the player's name in the middle. A display at the top of the screen is used for you to enter the name of the object that you want to put in the bag. When you finish inputting the name of the object, the letters animate over to the middle of the screen and then fall, in descending order, into the bag. You are allowed only as many misses as you indicated at the beginning of the game. After that many misses, you are eliminated and the remaining players continue.

After you correctly identify an item, you are told, "OK, I found it;" after you have correctly identified all of the items, you are rewarded with, "Great, you got them all." If you name the same item twice, you are told, "You already said that." The game ends when everyone has been eliminated. The displays at the end of the game are first class. Each player's name is displayed, the mistakes allowed, mistakes made and total number of times he/she guessed all of the items in the bag. Then a display shows all of the items contained in the bag at the end of the game (to settle those arguments) as well as a request for another game. *Bagit* is a challenge as a game and a programming delight.

VECTORS. Rowing a real boat across a real river with real paddles is somewhat easier than figuring out how to do it with the azimuth and river speed given and two keyboard arrows as oars and the numeric keys for stroke speed. The display shows the object of the game and a dock (box with a "D" in it) on the other side of a river, to which you must "row" your boat (a larger colored box). If you are as unlucky or uncoordinated or undereducated as I am, the perils of Niagara await you. There is a waterfall at the edge of the display over which my boat fell repeatedly to a melancholy CoCo refrain. As you move your boat by pressing the arrow keys and the numeric keys, the speed of the river increases (you can tell by the white flashes that simulate water going down the river and over the falls). My every attempt to control this process failed. Maybe you have to know something about navigation or aviation. Azimuth?

AHHA. A complicated program with no instructions is always a turnoff to me. This one turned me off. *AHHA* is a nongraphic adventure through a "sinister old mansion" to find the treasure chest. The deceased former resident of the mansion still lays claim to the treasure and will try to claim you as his most recent victim. The title for the program comes from one of the lines in the program. This adventure would probably be banned in Boston for its violence, but then I guess most adventures fit this mold. If you are somewhat familiar with adventures, you should enjoy *AHHA*. If you think adventures are weekend events in college towns, you better leave this one alone.

A final word. The price of this total package is only $8.05 ($9.95 in Canadian dollars), and even including the programs I wouldn't wish to own, that's quite a bargain for this package.

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CoCo Mail
Not First Class

By Frank J. Esser

Many businesses have the need to reach the buying public with advertisements and promotional material. Other businesses need to reach their customers with seasonal information and promotional material. Whatever the reason, the use of computer maintained mailing lists has been on the rise, especially with the advent of the personal computer. Many businesses which previously had to rely on others to perform these functions can now do them for themselves. But, they need the necessary software to perform these functions. Enter onto the scene the "mailing list programs." Early applications of microcomputers were devoted to this field and CoCo is no exception. *CoCo Mail* is one of these programs. It is described as a program to help fill the void of business programs available for CoCo. It is basically a mail list program with a few frills added.

CoCo Mail comes on a standard 5¼" floppy disk. *CoCo Mail* requires 16K of memory and one disk drive. The documentation is enclosed in a vinyl three-ring binder. The printed material consists of 17 single-sided, typewritten pages. The introduction gives a brief overview of the programs and what they will do. The first chapter gives a detailed overview of *CoCo Mail* and how it works. There is some confusion in this section and later sections along with the menus themselves. The confusion comes from the author's use of the term "file." It is this reviewer's opinion that the author consistently misuses this term. The general use of the term "file" is to indicate a collection of information or data arranged in a specific manner. Sub-elements of the file are understood to be records within the file. Groupings of records within the file are usually understood to be segments of the file. The author consistently refers to records as being files and this is where the confusion occurs. If further subdivision is required then the records can be broken down into fields. Most mailing systems will group the name, address, city, state and ZIP together to form a record with each of the above being a field within a record. Actually that is what *CoCo Mail* is doing; it just does not say it that way. The third section is devoted to explaining how to backup the disks and how to get *CoCo Mail* started. The next and final section explains each of the prompts on all the menus used by the programs.

CoCo Mail consists of a series of small programs placed on a disk and controlled by a master program called COCO/MAL. *CoCo Mail* is started by typing RUN COCO/MAL. Once the master program is up and running, a menu is presented offering options:

1 — Initialize
2 — Update File
3 — Review File
4 — Delete File
5 — Print Labels—2 Across
6 — Print Single Labels
7 — Create Transfer File
8 — Process Transfer File

I would like to review each of these functions one at a time.

The INITIALIZE function is used to create the data file. The file created has the name MAIL/LST and is 23 grans long. The name is not optional and only one file per disk is supported. The file size is limited to 200 records, each record being 256 bytes long. A little fast arithmetic will indicate that indeed the program is using a full sector for each record.

The second function is the UPDATE FILE function and it is used to enter data into the file. The data is entered from a screen menu, which has a submenu that requests the following information.

1) Add a file—Really you are adding a record to the file. The only way data can be entered into the file.
2) Add to notes—A method to add to the notes which were or were not entered via step 1 above.
3) Change address/phone—Provides a method to change any of the fields of a given record.
4) Exit—Returns you to the main menu.

Upon the completion of the data entry for each record you are not returned to the submenu, but instead are returned to the main menu. Thus, if you have more data to enter, you are forced to go through the reenter sequence to get back to the UPDATE FILE section.

The REVIEW FILE section consists of a menu offering the following choices.

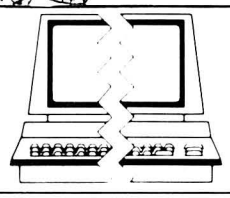
1) Review by Name—Provides the user with a method to call up a given record for review, given he knows the exact name for the record in question.
2) List to Printer—Provides for a dump of the entire data base to the printer.
3) Exit—Returns the user to the main menu.

The use of the review by name option requires that the user know the exact name being requested, otherwise a match will not occur.

CoCo Mail does not support a method which will let the user scroll either backwards or forwards through the data file.

The DELETE FILE section provides the delete function at the record level. This is one of the areas where the aforementioned confusion sets in, especially since *CoCo Mail* allows for only a single file. However, what is really happening is that a record is being deleted. Again the user is required to know the exact name associated with the record he wishes to delete. If he does not, a match will not be found.

PRINT LABELS—2 ACROSS is the label generation section which will print labels, two to a row. It appears that the program was set up to handle labels which are 15/16"


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wide and requires labels that are 3" long, two abreast. The program does not provide for provisions to handle different size labels.

PRINT SINGLE LABELS is the same as the previous command except that it will handle only single labels, one abreast.

CREATE FILE TRANSFER provides the user with the ability to select certain records from the original file for transfer to another file on another disk. During the transfer process, the original records are deleted. There are no options offered. The process creates a sequential file on both the destination and source disk, called "CODE/FILE," which contains the records being transferred.

PROCESS TRANSFER FILE command is provided to help retrieve data if an overflow condition occurs during the transfer process. The process transfer function also will add records from the CODE/FIL file on this disk to the master file.

CoCo Mail is advertised as a mail list program. It appears to this reviewer that the program is aimed at a very small group of applications. Since *CoCo Mail* restricts the user to only one data file per disk and that file has a maximum of 200 records, I find its application very restricted. As a general mail list program I think it fails to pass the test. The program lacks flexibility in its application. There are no provisions for using multiple drives, the data files cannot be expanded, and they are limited to only 200 records even though the disk allocation would allow for 207 records. The program disk consists of a series of rather short programs which are constantly swapped from memory as the options are exercised. The screen handling is very elementary, with repeat lines causing the menu to scroll off the screen. The update function takes you all the way back to the main menu after each entry, thus requiring you to go through the selection process for each record entered. The search function requires that the exact name be known or else a match will not occur. The review section does not provide a method to scroll through the data file a record at a time. The documentation is somewhat confusing to read in that terms are interchanged throughout. The terms *file* and *record,* and *sort* and *search* are interchanged a number of times. *CoCo Mail* does not provide a sort function at all. A sorted mail list can only be obtained by knowing beforehand what the range is for the field to be sorted on. Thus, if the records are entered out of order or later entries are out of order, selective printing of the data file is required to get them in order.

I had problems getting the transfer function to work properly. The instructions are rather vague about just how to use this option. The user is forewarned that experimentation is required to get this process to work properly. I finally resorted to listing the programs to determine just what was going on. I found the process to be extremely simple. The conclusion reached is that the documentation is confusing and not the process. The transfer function will remove from the data file those records that match the code entered and will place these records on a file called CODE/FIL. Once the file has been built, the names are deleted from the original data file. Then, this file is copied from the original disk to the new disk using BASIC's copy command. Using the option PROCESS TRANSFER FILE, the CODE/FIL is read and the records contained in it are transferred to the regular data file. This completes the transfer. There are no options associated with this transfer. The records will be deleted from the original file; thus, if you want to retain a master file, they must be reentered. I did not try it, but I believe if you now run the PROCESS option on the original disk it will replace the deleted records.

In conclusion, *CoCo Mail* is a mail list program which I believe has very limited application. It most certainly will not meet the needs of a business which has more than 200 customers without a lot of effort on the part of the user. *CoCo Mail* will only handle one data file per disk, leaving a free space of 30 grans to be perhaps wasted. The documentation is confusing because of the interchanging of the terms mentioned above. The section on transferring data from one disk to another is confusing. The system disk consists of 12 programs, one of which is the data file. The programs are short and are constantly being loaded from disk each time a new option is exercised. The screens are in the form of menus, but in some cases the wrong answer to a prompt causes the menu to scroll. Enough wrong answers and the menu is gone. The programs in general lack the sophistication normally found in private sector software. However, *CoCo Mail* will maintain a mailing list of 200 names per disk, and it does have all the functions necessary to properly maintain that data file. I generally like to refrain from talking about the price of a particular software package because the net worth of a package to a given reader should be his judgment alone. In this case I believe that the price is out of line. It is the opinion of this reviewer that the programs are not worth the $59.95 that is being asked.

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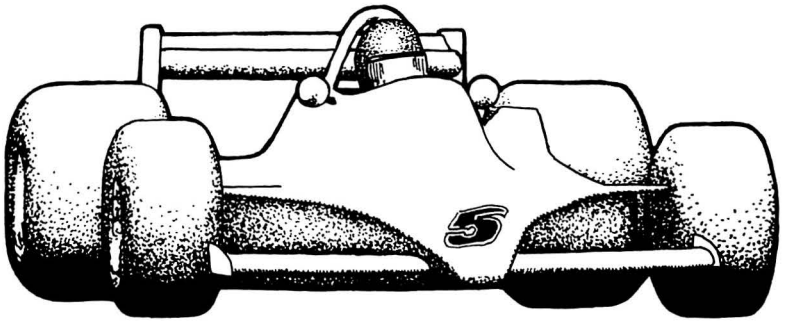
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You have mastered this powerful car on a difficult track, driving with the assurance and precision that comes only from long hours of practice.

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FANTASTIC ACTION

Revolution uses high resolution, machine language graphics for action that is smooth and fast. The emphasis is on authenticity in the control and motion of your car. As in driving a real race car, accuracy and precision in your driving are what counts. Frills and non-essentials have been left out.

PURE COMPETITION

Like a real race driver in practice and qualifying sessions, you compete against the clock and against the existing lap record for that track. *Revolution* records the lap records and the name of the person who set the record, so you always know who reigns supreme on your favorite track!

DESIGNED WITH YOU IN MIND

Revolution is menu-driven, and self explanatory. Information screens tell you what you need to know. When you're ready to play, a menu of the names of all your tracks is displayed, along with the lap record for each track and the name of the person who set that lap record. You select a track with a single keystroke, and *Revolution* takes you there.

A NEW CONCEPT

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The first time you run *Revolution,* you will be able to choose from several tracks and cars which are included with the game.

But, with *Revolution,* this is only the beginning! You can create as many tracks as you like. You can make each new track as difficult or as easy as you wish. You can make easy ones to begin with, and tougher ones as you become more skilled. You may find creating tracks to be almost as much fun as driving on them!

You can save your favorite tracks to run on again whenever you wish. *Revolution* will automatically add these new tracks to the menu. And you can exchange your favorite tracks with other *Revolution* owners.

Be careful, though, about letting your friends play this game. They may not want to let you have your computer back!

THE EARLY *REVOLUTION*

A prototype version of *Revolution* was published in the September, 1982 issue of Rainbow magazine, under the name *The Track*. The response to *The Track* has been terrific.

Revolution has all the features that have made *The Track* a favorite, and *Revolution*'s fast, high-resolution machine language graphics are dramatically improved over the prototype's.

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The original *Revolution* for the TRS-80™ Color Computer requires 32K and one disk drive. A new cassette version has action just like the disk version, and similar track-saving features excluding a menu of available tracks. The cassette version will run on a 32K Color Computer or TDP-100. You can upgrade to the disk version later, too, for a nominal fee.

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Wild Party
Definitely For The Daring

Ever been to one of those parties like you see in those R-rated movies where beautiful girls remove articles of clothing and suddenly there's a partially clad beauty everywhere you look? Neither have I, unfortunately, but the odds will be much improved for CoCo lovers in the near future, thanks to *Wild Party*, a new creation by B&B Software of Jenkintown, Pa.

Before this review continues any further, it should be obvious that *Wild Party* is not for everybody. It's not the kind of program you would want to have on your monitor when your mother-in-law or clergyman drop by for a visit. And it's definitely not for youngsters under 18 years of age. It is, as Larry Flynt, the publisher of *Hustler* might say, for "mature, open-minded adults."

However, one should not assume that *Wild Party* is particularly vulgar or obscene either. Naughty is probably a better description since the power of suggestion and the players' collective imagination and desire will determine how far one can go. There are no suggestive graphics or sounds; the program depends entirely upon screen prompts.

As a reviewer I tried to imagine myself in the midst of a party with lovely young women all around. And I'll have to admit that the suggestions would definitely liven up most parties.

The program offers several options, depending upon the degree of excitement you hope to create. You have your choice of "mild" or "wild." If you select the second option, the computer asks, "Are You Sure?" This selection has an effect on the events in the game and also varies the length. You also may determine whether you want to play a short, medium or long game. Another option is included for married couples or singles. From two to six couples may participate.

At the beginning of the game, the computer asks for the number of couples and their first names. If users are so inclined, the game could take some unusual turns by inserting various combinations of people's names as participating couples.

Using the RND function, the program selects an event by an algorithm which tends to save the more interesting events for last. Based upon the requirements for each event, the program selects either a single participant or a couple. By varying the order of the events and by modifying the events themselves, a lot of variety and spice is added. There is one particular event which, if repeated, is accompanied by the comment, "I'm repeating. I like this one."

Another event allows a participant to replace an article of clothing that was removed earlier. The program checks whether that person has removed any clothing and, if not, states that the privilege of replacing clothing may be saved until needed.

There are several events in which the computer selects a male and a female as the participants. If the group of players consists mostly of married couples, it probably would be more fun to prevent the computer from selecting a husband and wife as the participants by answering "Yes" to the question "Married Couples?"

In the program documentation, the creators say they did "literally thousands of test runs . . . to ensure that it is unlikely that someone will be completely undressed. On the other hand, given the way random functions work, it might sometimes happen." To which I would have to add that given the way human nature sometimes works, the suggestions could naturally lead to such an event.

The program is written in BASIC language, 16K memory is required and it will run with either non-Extended or Extended BASIC.

Other than the suggestions included in *Wild Party*, the program does not break any new ground in computer programming. It could, however, prove to be a great ice-breaker at your next party.

(B&B Software, P.O. Box 210, Jenkintown, PA 19046, $35 tape)

—Charles Springer

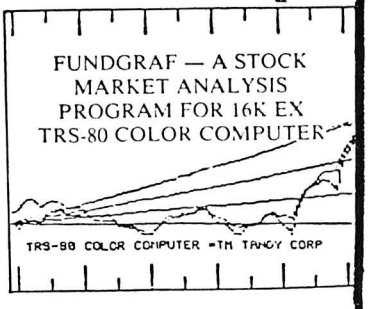
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Software Review

Colorout—A Versatile Blockbuster Of A Game

Colorout is a 16K machine language version of the classic *Breakout* game with all the options. Not only can you select joystick or keyboard control, but four different actions and four starting speeds as well. With this kind of versatility, the difficulty can be adjusted for any skill level from adult (novice) to 14-year-old "stick jockey" and provide good play value for all.

When *CLOADM*ed, the program first displays the title block and then proceeds to the game. You may call the menu at any time by pressing the BREAK key to select the number of balls, ball angle and the starting speed, as well as several other options described in the instructions. Once the game setup is made, you may play as long as you like without having to face the menu between each game. When a change is desired, pressing the BREAK key will send you to the menu for another setup.

When setup is complete, play begins. The playfield is colorfully presented in low res graphics. Three colored bars representing six layers of bricks are presented across the top of the screen, capped by a scoreboard line showing control mode (J for joystick or K for keyboard), ball remaining, current score and high score for this *CLOADM*.

Play is straightforward with good control in both joystick and keyboard modes. My sons, ages 11 and 14, preferred joystick control, but thought the keyboard mode was almost as good. Game action is good, although the sound effects are not very thrilling. The ball speed increases from the prescribed level as play progresses making things more difficult. Although four ball speeds are selectable, there is very little difference among them. I feel that two speed selections would be more realistic. There is no outstanding reward for clearing the screen, just another 3150 points and another layer of blocks. This is more of a cosmetic comment than a criticism of the play value of the game.

The instructions included were on two sides of an 8½ x 11 sheet and did a good job explaining the game and the different options available. The only problem was in the callout of the keyboard keys to use for paddle control in the keyboard mode. The quotation marks enclosing the description were blank! The obvious answer was correct in this case, the right and left arrow keys are the ones to use.

The instructions include a section on troubleshooting hints for common problems. For disk system users, instructions for transferring the program to disk are included. Spectral Associates also offers to replace a tape that becomes unusable for any reason, for $1.50 and the return of the original tape.

Overall, I feel this is a game with good play value and enough versatility available from the menu to provide a good *Breakout* game for players at all skill levels.

(Spectral Associates, 141 Harvard Avenue, Tacoma, Washington 98466, $12.95 tape, $16.95 disk)

—Charles Bream

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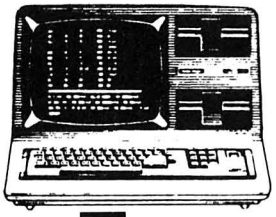
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Pie Zapper: All Cherry (No Lemon, No Apple)

The Three Stooges would have loved the title, but Southern Software Systems had something more serious than flinging lemon meringue pies in mind when the *Pie Zapper* was written.

The *Pie Zapper* is the third release in a series of graph preparation programs. Following *Graph Zapper* (bar graphs) and *Bar Zapper* (bar graphs), *Pie Zapper*, with your Color Computer, creates (logically enough), pie charts.

Pie charts are useful in showing the relationship of a few parts to a whole, in the familiar form of a circular "pie shaped" chart. Each slice of the pie represents a percentage of the total "pie." The size of each section is proportional to the percentage of the total pie represented by that section. Pie charts are most useful when comparing a small number of variables. Five to eight slices are ideal. I use pie charts to show our company's market share relative to the total market.

The pie charts are created by using data entered by answering a series of inquiries generated by the program. *Pie Zapper* allows you to:

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- Add slices to your pie.
- Change data.
- Insert slices to an existing pie.
- Delete slices from your pie.
- List the data currently in the program.
- Save and load the data and completed graphs to or from disk and tape.

As you input the values of each sector (slice), *Pie Zapper* converts each value to a percentage of the total value and displays the pie with each slice labeled, and percentaged if the user desires.

Since the graphs are displayed in *PMODE 4* for the highest possible resolution, you are limited to a choice of two color configurations, either green and black, or buff and black. Instead of using different colors to differentiate the slices, these sectors can be shaded with your choice of six different "fillings." (Sorry, apple is not available.) In use, the slices are distinct and not confused.

Southern Software Systems is advertised as making "Serious Software for the Color Computer." *Pie Zapper* is indeed *serious software*, usable in statistics, business and hundreds of other applications. But in this case, serious doesn't have to be scary.

As with other *Zappers*, the program guide supplied is exceptionally well documented. The 23-page manual walks the user through the various menus and choices which result in the graph being "zapped" on the screen. Helpful hints are given, including what to do in case of a program abort.

Authors of commercially oriented programs should beg, borrow or steal one of the instruction manuals to see "The Right Way To Do It."

Your "pie" can be printed using a screen print program and a printer with graphics capability. Specific instructions are included to merge the 32K version of *Pie Zapper* with a Screen Print Program from Custom Software Engineering (GSPR).

After merging, a "hard copy" of your graph is produced with the push of a button. Since Custom Software Engineering offers programs for most all printers, this program will be of special interest to non-Radio Shack printer owners.

Pie Zapper comes in two versions: 1.0 for 16K tape machines, and 2.0 for 32K, either with tape or disk. Version 2.0 checks to see if you have a disk connected. If so, the options of loading and saving to and from disk are displayed—if not, they're not—neat!

In summary, *Pie Zapper* is a thoughtfully documented, extremely usable utility for the Color Computer. It costs $15.95 for the 16K version or $19.95 for the 32K version and it even comes with a 14 day, money-back guarantee—what a show of trust of one's fellow man.

(Southern Software Systems, 485 Tropical Trail, Suite 109, Merritt Island, FL 32952. Custom Software Engineering has the companion Screen Print Program. They're at 807 Minuteman Causeway, Cocoa Beach, FL 32931.)

—Bruce Rothermel

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Composing In Stereo With *Stereo Composer*

The *Stereo Composer*, produced by Speech Systems, is a software and hardware enhancement of another product of theirs called *The Composer. The Composer* is a software package which greatly increases the sound producing capability of the Color Computer by enabling the production of music in four part harmony. (A review of *The Composer* appeared in *the Rainbow*, June 1983.)

The *Stereo Composer* allows you to easily hook up your stereo system or two 8-ohm speakers to your Color Computer. When music is played, two of the four parts produced will come out one speaker while the other two parts will be heard through the other channel.

Hardware consists of an enclosed board which connects to the cartridge slot of your Color Computer. In order to use disk drive with this package, you will need a Y-adapter or an expansion interface allowing you to hook up two boards simultaneously to the cartridge slot. Otherwise, you will need to use the cassette version even if you have a disk drive. Contained on the board are two 8-bit digital-to-analog converters (DACs) which give much improvement in sound quality over that offered by the single 6-bit DAC contained in the Color Computer.

Connection is made to either your stereo system or directly to speakers by way of two standard phono connectors on the board. Two cords (each over nine feet long) with male connectors on each end are supplied for your convenience. Also on the board are volume controls for each channel.

Software received is the same package as *The Composer* except that sound is routed through the DAC board instead of the internal DAC of the Color Computer. Music produced no longer comes out your television or monitor speaker.

Also contained on the software package is a program called "Jukebox." This program contains 16 ready-to-play songs and sound effects. This is a great increase over earlier versions of *The Composer.* Songs ready to play are "Exodus," "Color My World," "Mexican Hat Dance," "Beer Barrel Polka," "Yellow Rose," and others. In the cassette version, the songs and effects are automatically loaded and played in sequence. This gives more than 20 minutes of listening pleasure (interrupted by the time it takes to load each song). On the disk version, each song may be selected separately or also played automatically in sequence. To my dismay, though, the sound effects examples sounded only through my television speaker and not my stereo as I expected them to. Also, the new manual (an enhanced version of earlier versions) does not contain any information on how to achieve the effects. I would expect that the stereo capabilites would also increase sound effects capabilities. This capability needs to be explored in greater details by Speech Systems as I am sure that many CoCo users could make use of it.

When the program is *RUN*, the following menu appears

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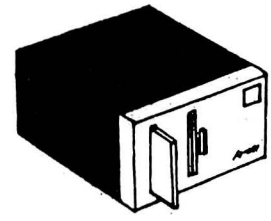
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7. SAVE SOURCE (BASIC)
8. GRAPHICS ON/OFF
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Music that you enter yourself must be prepared by first selecting option 9 and then developing a "source" program of *DATA* statements (one *DATA* statement for each group of four notes which will be sounded simultaneously). Each note is entered as its letter name and a number indicating its octave. At the end of each *DATA* statement (group of four notes) must also be entered a letter indicating the group's time duration. Control of sound through the speakers is had by order of placement of the notes within each statement. The first two of these notes will be heard through one speaker while the other two will sound through the other speaker.

Two features have been added to *Stereo Composer* that did not appear in earlier versions. One is a REPEAT command and the other is a BASIC command. Both commands are used by embedding them into the *DATA* statements while preparing music. The REPEAT command allows sections of music to be easily repeated without having to double up on *DATA* statements. The BASIC command allows control to easily pass back and forth between music being played and a BASIC program.

As stated earlier, the sound produced is much better than that offered by the internal DAC of the Color Computer using only a monitor speaker. Some of the sounds produced are quite good and clear in quality although I still desire better sound quality for serious applications.

Overall, this package is a good buy. The price is reasonable and less than prices available for similar packages for other computers. Those of you interested in musical applications of computers would benefit from the added stereo capability and improvement in sound offered by two 8-bit DACs over the single 6-bit DAC contained in the Color Computer.

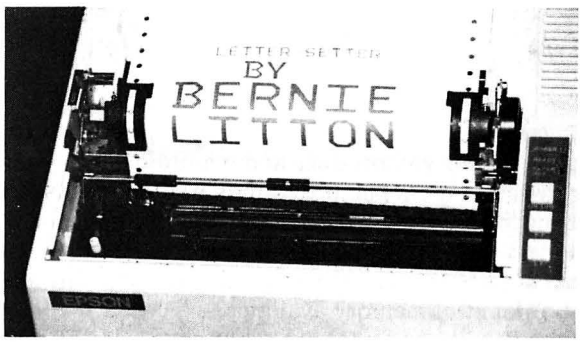
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Sort, Search, Save, Delete With *Program File*

Program File is an excellently written piece of software designed to help you produce and maintain a file system of your cassette tapes. The program is written in BASIC with some machine language *POKEs*. It will run on a 16K ECB machine, which will allow 100 programs to be stored. If you have 32K, you can store 350 programs. The software adjusts to the amount of memory available.

If you are like me, you probably have a lot of cassette tapes lying around with a hundred or more programs on them and you don't know what programs are on which tapes. If that's the case and you want an organized index of your collection, then *Program File* may be for you.

Program File is a mini-database type program that will allow you to input four types of information about each program you have on cassette. The pieces of information you can input are: 1) PROGRAM NAME—This is the eight character or less name assigned to the program; 2) PROGRAM TYPE—This identifies the type of program such as game, utility, education, etc.; 3) LOCATION—Allows you to identify which tape the program is on; 4) COMMENTS—This allows you to make brief comments about the program such as: a real dud, PCLEAR 1 before loading, etc.

Once you have all this information entered you are in for a real treat because *Program File* has some really nice features. First, when you save your data to tape, a second copy is made automatically. Then, when the second copy is saved, CoCo asks you if you want to verify the save. If you respond with a yes, you are prompted to rewind the tape to the beginning of the data and press ENTER. If the save is good, you will be advised and returned to the main menu. The second thoughtful feature is that if the program bombs, or you hit the BREAK key while entering data, etc., your information is not lost. You simply type "GO TO 5" ENTER and you're back in business.

Once the data is saved on tape you can have your records listed to the screen or printer. When listing to the screen you will be offered five scan speeds. You can stop the scan at a record by pressing any key. You may then continue the scan, modify the record, or return to the menu. If you choose the printer option you can either print all or individually selected records.

There are three other options of particular importance: SORT DATA, SEARCH RECORDS and DELETE RECORDS. The sort routine is fast. I entered data for 118 programs that I have on 19 different cassettes in 11 categories. I then asked CoCo for a sort by program type, program name, and location. It took a grand total of 6.78 seconds. Now, that's not bad.

The search option lets you search in any of the four fields for a particular record. The computer will scan your data and present the first record encountered with a match to the string you are looking for. When the record is presented, you will be given the option of continuing your search or returning to the menu. Finally, the delete option allows you to delete records by name, number or all records.

This is an excellently written piece of software with plenty of on-screen prompts to allow you to operate the program without referring to the instructions. Speaking of instructions, the four, 8½ x 11 pages are written in a clear, logical, easy to read order.

Since the program is written in BASIC, it would be easy to modify for keeping files of things other than your programs. It should also be easy to convert the program to operate with a disk system.

As a bonus for those of you that subscribe to *CoCo Cassette* magazine—and even for those who don't subscribe—the first six issues are included in a demo file on the tape.

If you are looking for this type of software, then this program would be a good investment.

(Owl's Nest Software, P.O. Box 579, Ooltewah, TN 37363, $14.95)

—Michael K Hunt

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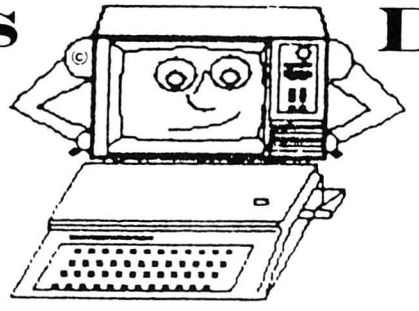
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A *Scribe* For Hire

Well, here I am, floating around the Pacific Ocean on board the world's *only* active battleship, without much to do (except work, of course). Then, finally the word is passed over the announcing system: "MAIL CALL!" Hey now, this is perfect; *the Rainbow* has sent me something else to review—Computerware's *Color Scribe* 32K disk word processor. I just got my disk system a few weeks ago, so this should be a good chance to see it *really* do something.

As I begin to look through the documentation (50 full-size pages of daisy-wheel print), the first thing I notice is that *Scribe* is a line-oriented program, while the program I already use is a screen-oriented program. After going through the manual in-depth and practicing with the numerous functions, I noticed some more differences from what I am used to and some similarities.

The *Color Scribe* disk comes with two copies of two different programs: SCRIBE.BIN and SCRIBE51.BIN plus a demo text dump for illustration purposes. SCRIBE is the standard version using the 32 x 16 screen with reverse video while SCRIBE51 uses ML graphics to generate 51 x 24 text (sound familiar?).

Both programs have basically the same features. And all the features you would expect in a good processor are there: SEARCH for and REPLACE text; MOVE or COPY text; printer CONTROL CODES embedded in your text; RIGHT JUSTIFICATION if desired; HEADERS and FOOTERS; a variety of DISK and CASSETTE I/O functions; etc. And there are a couple of nice "bells and whistles," one of which *is* a "bell" that can be set to go off after any number of characters from 1—127. Another is a MACRO command that can define a single keystroke to be one or more commands.

But, with all this going for it, I still never got really comfortable with *Color Scribe*. One thing that bothers me is inherent to line-based processors, and that is, obviously, having to deal with text line by line rather than as a whole. With a screen-oriented program, I find that I can just let my writing "flow" without even thinking about the program operation. But, not so with *Color Scribe*. Even after working with it for a while, I still have to put too much thought into program decisions as I was writing (I even went back to "Old Faithful" for the final draft of this review).

Another thing that I find a hindrance is the complicated command structure of switching back and forth between EDIT and TEXT INSERT with line specific information. Also, I am very disappointed in the editing of lines itself. For any particular line, you can change one text character for another, but to insert (for example) a missing comma you either have to rewrite the line from the point of the missing comma, or use the two words the comma *should* be between in a string REPLACE function. This may sound minor but it can really be a pain if you need to do very many of these "small" changes.

Being line-oriented makes *Color Scribe* a natural for editing BASIC programs saved in ASCII format, and this application does work out pretty good. Perhaps someone just starting in word processing would get used to *Color Scribe's* operation, but, for the price, I really feel your money could be better spent elsewhere.

(Computerware, P.O. Box 668, Encinitas, CA 92024, $49.95 disk, 32K required)

—Bruce Sterling

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Worth Repeating

This John Dana program is one of our favorites. Type *RUN*. Hit ENTER *twice*. Key in your name. Then, pound away on the space bar. Then, *RUN* again and key in a number between 96 and, say, 150 and hit ENTER. Now try the "color" keyboard.

```
1 'COLOR CRAZINESS
5 CLEAR 600
8 INPUT N
10 A$=INKEY$
15 IF A$<>""THEN A$=CHR$(ASC(A$)
+N)
20 B$=B$+A$
30 PRINT B$;
40 GOTO 10
```

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Requires 16K Extended Basic. 32K recommended.

1982 TIMS Bibliography - $9.95.



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Auto Run will help you create your title screen with the graphics editor. The graphics editor allows you to choose a background color and border style. Using the arrow keys and several other commands you can draw pictures, block letters and also include text.

Auto Run will generate a machine language loader program to preceed your program on the tape. Then, to start up your program, simply type CLOADM to load in the Auto Run loader program, which will then automatically start itself up, display your title screen, load your program and then RUN or EXEC it.

Also you may record a vocal or musical introduction preceeding your program. The Auto Run loader will control the audio on/off.

Basic programs can be set to load anywhere in memory above the PCLEAR 0 page.

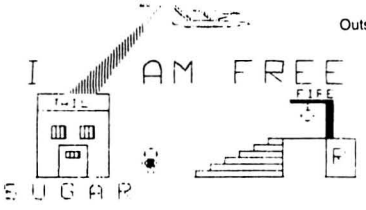
Software authors: The Auto Run prefix may be appended to your software products.

Price includes complete documentation and assembly source listing.
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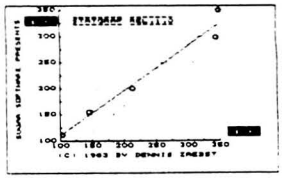
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Requires 32K Extended Basic.



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Super Color Writer II Lives Up To Its Name

By Stuart Hawkinson

Color Computer software has evolved over the past few years from a few simple basic games and utilities to a sophisticated collection of professional application programs. Word processing programs have shown a remarkable improvement in the number of features offered and ease of use. For many people, word processing is the primary purpose of having a personal computer. The software for letter and manuscript writing has to be good. Not only do the programs have to support a wide range of functions for ease of editing and formatting text, they must also integrate those functions into an easy to use framework.

Super Color Writer II, Version 3.0, is a very well designed word processing program for the Color Computer. It has practically every feature you could ask for in a personal computer program. Included are complete editing and formatting capabilities as well as a full range of printer control codes and display options. These extensive functions are integrated into a consistent set of keyboard commands and screen prompts, providing the user fine control over the editing process. *Super Color Writer II* is not inexpensive or simple to learn, but the time and money invested are well spent for the person who wants to use the Color Computer for serious work.

The *Super Color Writer II* manual, presented as a word processing tutorial, is written in a clear yet detailed style. The manual covers all the operations of the program, starting with a survey of screen presentations and modes of operation. Topics include a complete discussion of editing text, saving and loading text files, text formatting, printing and page formatting, and a thorough explanation of printer control via special non-printing codes. A complete summary of the commands, additional information about printer codes, and assistance with poor TV displays is covered in the eight appendices.

The manual, packaged in a padded three-ring binder, was produced using *Super Color Writer II* with a high quality daisy wheel printer. I reveiwed the disk version of the program which comes on a protected disk. Backup copies are available through Nelson Software's Customer assurance plan. The program loads and auto executes by typing *LOADM*"WRITER". From that point you can remove the program disk from drive 0 and substitute a formatted disk to save and load text files.

The program operates in three basic modes. The edit mode allows you to enter and change text, locate and manipulate strings of characters, and reorganize blocks of text. The command mode allows changing display formats, saving and loading tape or disk files, and setting up special program functions. Finally, the window mode allows previewing the formatted text in a form very close to the one to be printed. Moving between modes takes only one or two keystrokes, and the next response expected is always clear. For example, to locate a string while in the edit mode, type <CLEAR><L>. The prompt on the command line is "Locate," to which you respond with the search string.

The program provides a wide range of features and options. The Color Computer display can be selected in one of nine densities, from 32 characters by 16 lines, through 51x21, 51x24, and up to 85x24. The 64 character line display, which may be somewhat difficult to read for some, has the lower case descenders and is about the same as other true high res "character" screens available. The 85 character per line mode is difficult or impossible to read with a normal TV monitor. However, these display modes are very useful for giving a final impression of the formatted text before printing.

The display can also be selected in one of four color combinations. The line width is adjustable to 240 characters. A horizontally scrolling window is used to view editied text. Several other user convenience features are selectable, including word-wrap (turning it off will allow the display to keep up with keyboard input), key-repeat, and an echoing key-beep. The program's type-ahead buffer can keep pace with the fastest typist. Another friendly feature is the 'undo' command which will restore deleted text or delete newly inserted material. If you can't remember a particular command, pressing <CLEAR><?> will bring up a multiple screen memory.

With this program, you are in full control while driving the cursor around the screen. Not only can you use the arrow

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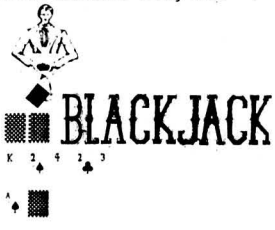
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keys to move up, down, left, or right, but you can also move right or left one word or to the beginning or end of a line. With just one or two keystrokes, you can move to the top or bottom of the screen or the beginning or end of the text. (Some word processors only allow you to move the cursor a character or a line at a time.) *Super Color Writer II* also gives you this power with the delete command, so be careful! A complete set of block commands includes move, copy, or delete. And you can work with a single block, or up to 10.

Many popular word processors operate in the overstrike mode. When you type with the cursor over a line of text, the new characters replace, or overstrike, the old. Other programs use the insert mode. Typing new characters results in inserting them at the cursor position. Then, you must delete the following unwanted letters. With *Super Color Writer II,* you start in the overstrike mode, but with <CLEAR><1>, you can change to the insert mode.

Access to a versatile "locate" command, allows you to find, replace, change, or delete text strings. The option to match only a portion of the characters in the search string allows the others to be freely substituted (the "wildcard" feature). This powerful command can also be executed a specified number of times, or executed only after verifying at each occurrence of the search string.

With the disk version of *Super Color Writer II,* you have complete control over disk file manipulation. In addition to saving and retrieving individual text files, you can rename or kill files from the command mode. The disk directory is displayed in a neat, two column format. If there are more entries than will fit on one screen, the program display halts until you press the key. The amount of free space on the disk is also displayed. (These are features that the Color Computer DOS should have!) To see how much text you have entered, type <CLEAR><;> to display the number of characters used, the amount of memory space remaining, and the number of disk granules required to store the text file. The "word" command displays the number of words in your text.

Several features demonstrate the complete control *Super Color Writer II* provides. A number of global print command options are used to format the text. Finer control is provided by inserting format parameters in the text as special format lines. Included are all the imaginable justification and spacing features plus options like footers, headers, and page numbering. An especially useful feature is the non-breakable space character (<CLEAR><SPACE>). This can be used to bind words or characters together to prevent insertion of extra spaces by the justification process. This also keeps the wordwrap feature from separating words.

Super Color Writer II also provides several mechanisms for controlling your printer. You can embed special codes in the text, as well as send codes to the printer via the command line input. With these features, you can produce underlining, bold face text, or any type font which your printer can deliver. Programs of printer control codes can be selected with a simple <CLEAR>followed by a number.

With so many features, it's hard to identify areas for improvement. One possibility is a print spooling facility. Some word processors allow you to send a large file to a disk buffer to be printed as a background task. You may then continue to enter or edit text from another file. However, with *Super Color Writer II,* you can link files together for continuous printing of lengthy documents. Another desirable feature would be to print a number of copies unattended. This function can be performed by the user programming a multiple execution of the print command. The only thing I found lacking in the documentation was a keyboard chart that summarizes the editing functions. Its inclusion would have made learning *Super Color Writer* much simpler.

The only problems I had with *Super Color Writer II* were those normally associated with learning a new system. With so many features and commands available, you might wonder how hard it is to get started using the program. I found that very few special features were needed to begin. Most of the special commands and parameters can be ignored at the start. Useful default values have been set. Simply printing a file with <CLEAR><P> will produce a well-formatted page of text. A few times during my initial work with the program, I got into an unexpected mode of operation. I started losing letters at the end of a line and then had them magically appear in an inverted order later. I finally discovered I was getting into the insert mode by accident. The manual does mention these strange happenings, if you read it carefully.

Another problem was with a clever feature called the 'OOPS' command. It is designed to recall text that has been inadvertently deleted. However, it only works with text that has been deleted following the cursor position. Text before the cursor can also be deleted, but that text is gone forever (as I found out during a demonstration of *Super Color Writer* to some friends.).

Super Color Writer II makes full use of the 64K CoCo by using bank switching. By not relying on BASIC, *Super Color Writer II* has access to the full 64K, thus allowing 41K of work space with a disk system. By "clumping" the hi-res displays, you can obtain an additional 8.5K of word space to get 50K total work space in the disk version. The program will be renamed *VIP Writer.*

My overall impression of *Super Color Writer II* is very favorable. In the month I have had the program for review, I have only scratched the surface. The program has nearly every feature and option possible to implement on the Color Computer. The design of the program is excellent; the programming is flawless. I found that the movement between direct keyboard commands, using the <CLEAR> key, and the special command mode was natural and easy to follow. With the few exceptions noted, the input needed was clear. I also liked the capability to control a variety of printers with the specially programmed codes. The manual is well-written and contains a wealth of detail. A beginner can find answers to questions easily, and all the features are thoroughly documented.

Super Color Writer II lives up to the claim of having "features for the professional, yet is easy enough for newcomers to master." It certainly is one of the best word processors available for the Color Computer, or any computer for that matter.

(Nelson Software Systems, 9072 Lyndale Ave. So., Minneapolis, MN 55420. 16K, 32K, or 64K Color Compuer, $69.95 on tape, $89.95 on Rom pack or $99.95 on disk.)

Simulation Contest

The winners of *the Rainbow* Simulation Contest will be published in our November issue — be sure to watch for the announcement. Also, Adventure buffs should start gearing up for *Rainbow's* Second Annual Adventure Contest.

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PRINT #-2,
(continued from page 14)

should be even bigger than the first one in Chicago last spring, so make your plans.

There will be several seminars in connection with the show. These, alone, are worth the price of admission. But, the seminars are at no charge. So, you can come to Fort Worth and attend the seminars for free. Tickets are only necessary to get entry into the display area (but who would want to miss it!).

We have been doing some very exciting things here at *the Rainbow* with the new OS-9 package, some of which will be reported to you by Dan Downard, our technical editor. But, among them are multi-user operations and we encourage you to look at these possibilities, too.

We have been successful using the MC-10 and the Portable Computer as terminals, running software in a multi-user format — one program out of the CoCo itself and the other out of the MC-10 or Portable Computer. Now, considering the MC-10's price, that's a pretty inexpensive terminal to have for timeshare.

And, on the same subject, I hope you will welcome Dale Puckett to *the Rainbow*. Dale is one of the world's top experts on OS-9 (he's just finished a book on BASIC09) and will be sharing his expertise with you every month. We're proud to have him with us.

By way of "finally" for this month, we urge you to keep your eyes open at a number of new things coming for your favorite computer — from third party vendors as well as from Radio Shack itself. As I said earlier, this is one of the most robust of the personal computer markets and there are many good things on their way to you.

One of those things is a new book which we will publish in time for Christmas, called the *Rainbow Book Of Adventures*. This will contain the top adventures from our contest last year. More details are coming.

And, speaking of details: We'll be starting up the Second Annual Rainbow Adventure Contest next month. Lots of good prizes for that one, too!

It will coincide with the announcement of winners of the Rainbow Simulation Contest. Yes, we've got some good things on their way to you!

Hint . . .

Print Out Disk Directory

If you have a long disk directory and want to see all of it, or if you simply wish to have a hard-copy printout of your directory, on simple command will allow you to do this easily.

Just *POKE111,254:DIR* and the entire disk directory will appear on your printer, even if it is too long to be fully displayed on your screen.

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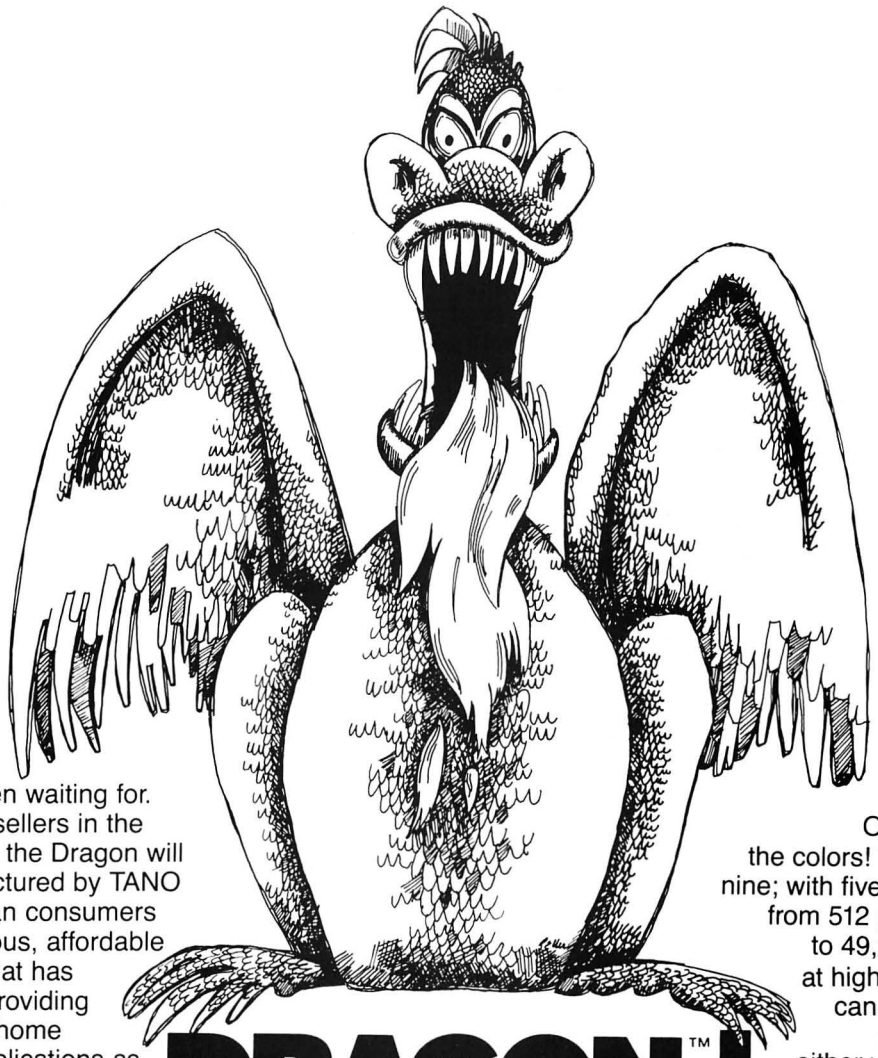
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Using the new 6809E Microprocessor (a great advance on the original 6502 still used by our competition), the Dragon brings advanced computer functions well within your reach. And priced below $400, it's anything but expensive.

But these aren't the only points of difference with which our Dragon roars. Unlike most units, the Dragon gives Extended Microsoft™* Color BASIC as its standard language while the competition is still stuck in Microsoft™* BASIC training. The Dragon's advanced graphics features include set, line, draw, circle, paint, print @ and print using. Of course the Dragon also features advanced sound capabilities.

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RECEIVED & CERTIFIED

The following products have been recently received by *the Rainbow*, examined by our magazine staff and approved for the *Rainbow Seal of Certification*, your assurance that we have seen the product and have ascertained that it is what it purports to be.

This month the *Seal of Certification* has been issued to:

The Programmer's Toolkit, six 16K programs to aid BASIC and ML programmers which include: **CROSSREF,** a ML program which prints line location of all variables and a sorted cross reference list for the source and destination for every GOSUB and GOTO statement in a BASIC program. **CMERGE,** a ML subroutine which saves the trouble of retyping long subroutines. **CHAINRUN,** a program that allows program chaining. **HEXEDIT,** a ML program which gives full edit capability in hexadecimal or ASCII for any RAM address in memory. **EDIT,** a ML program which gives full screen edit capability for any BASIC program. **DUMP,** a program which displays the memory contents of ML programs. Includes a 10-page instruction book. Moreton Bay Software, 316 Castillo Street, Santa Barbara, CA 93101, tape $28.95.

Question And Answer, a set of five 32K ECB educational programs designed to help children in the early grades and more advanced pre-school age children to understand and use common mathematical concepts and symbols. Moreton Bay Software, 316 Castillo Street, Santa Barbara, CA 93101, tape $17.95.

Addition Thrills and Subtraction Action, two 16K ECB educational programs for grades 1—4. One- and two-digit addition and subtraction practices are presented in a game format for up to four players. Moreton Bay Software, 316 Castillo Street, Santa Barbara, CA 93101, tape $14.95.

VRXREF-Variable Cross Reference, a 16/32K ECB tape/disk BASIC utility program that locates all variables and "where used" line numbers in a ECB program with optional printer output. Micrologic, Box 193, First Avenue, East Brady, PA 16028, tape $6.95.

LLSTFM-Llist Formatter, a 16/32K ECB tape/disk BASIC utility program that has user-selectable margins, page lengths, top-of-form, font size and line length. This program will also title and date listings, start and stop listings at any line number, give option of space between lines and single-sheet pause, and highlights line numbers. Micrologic, Box 193, First Avenue, East Brady, PA 16028, tape $9.95.

DRB-Disk Directory with Bytes, a 16/32K ECB tape/disk BASIC utility program that gives same information as DIR, individual file bytes, plus free and used total files, grams and bytes. Also includes optional disk name, and lists to screen or printer, plus a separate disk name program. Micrologic, Box 193, First Avenue, East Brady, PA 16028, tape $7.95.

Arex, a 16K arcade game for one or two players. Objective: As Arex Commander, you must occupy and hold enemy territory while avoiding three alien dangers. Adventure International, P.O. Box 3435, Longwood, FL 32750, tape $34.95.

Borrow, a 16K educational math program for grades 2—4 with seven skill levels. This program allows the student to reinforce subtraction skills. Problems appear in large graphic numerals and small boxes above the numerals allow for regrouping procedures. B5 Software, 1024 Brainbridge Place, Columbus, OH 43228, tape $19.95.

ABC's, a 16K ECB educational program designed to help children practice the letters of the alphabet. B5 Software, 1024 Brainbridge Place, Columbus, OH 43228, tape $9.95.

Hangword and Scramble, two 16K ECB menu-driven educational games. Objective: Practice spelling skills by playing **Scramble and Hangword** and creating your own word lists. B5 Software, 1024 Brainbridge Place, Columbus, OH 43228, tape $14.95.

Bio Detector, a bio-feedback monitoring device which allows the CoCo to "read" the amount of stress the user is feeling and graphs the skin response on the screen. The Bio Detector can be used to help you learn to lower your personal stress level, to observe your reaction to questions or other stimuli, or to play Anxiety Attack. It can also be used as a lie detector. Includes cassette, wrap finger grips, and instructions. Computerware, P.O. Box 668, Encinitas, CA 92024, tape $34.95.

Super Screen 1.1, a ML program that upgrades the performance of 16K Extended and Disk BASIC Color Computers. Replaces 32 character by 16 line display with a new 51 character by 24 line display screen including a full upper and lower case character set. Other features include full implemented PRINT@ and ON ERROR GOTO statements, combines text with hi-res graphics, auto-key repeat, and control codes for additional functions. Mark Data Products, 24001 Alicia Parkway, Suite 207, Mission Viejo, CA 92691, disk.

Clock Drill, a 32K ECB educational program designed for pre-school children through third grade. This program teaches children to understand time on a clock face and convert it to digital notation and to tell time by increments of 60 minutes, 30 minutes, 15 minutes, five minutes and by the minute. CY-BURNET-ICS, 5705 Chesswood Drive, Knoxville, TN 37912, tape $24.95.

CSRD-Copy/Search/Replace/Delete, a 16/32K ECB tape/disk BASIC utility program for ASCII textfiles, programs or datafiles to change long variables, keywords, spelling and capitalization. Same as disk copy but to and from disk or tape. Micrologic, Box 193, First Avenue, East Brady, PA 16028, tape $7.95.

LNXREFER-Line Cross Reference, a 16/32K ECB tape/disk BASIC utility program that provides a sorted listing of all referenced line numbers from all occurrences of THEN, ELSE, GOTO, GOSUB, and RUN—optional printer output. Includes optional REM, REMV—removes all unreferenced REMs and comments (and line numbers if REM is first)—removes comments from referenced REMs and includes optional line protect feature. Micrologic, Box 193, First Avenue, East Brady, PA 16028, tape $7.95.

Spelling, a 16K ECB, menu-driven spelling drill program that will allow you to enter your own spelling lists, drill them and create word lists to be printed. B5 Software, 1024 Bainbridge Place, Columbus, OH 43228, $16.95. **Spell-Grade-4,** a data tape to be used with **Spelling** or **Hangword & Scramble** tape $8.95.

Question, a 16K ECB educational drill program that allows student or parent to enter questions of any category and multiple choice or true/false answers in a quiz form. Also can be listed to the printer. B5 Software, 1024 Bainbridge Place, Columbus, OH 43228, tape $19.95. **Nouns and Verbs,** a data tape of eight lists and 15 multiple choice questions to be used with the **Question** program, tape $8.95.

Money Manager, a 32K ECB menu-driven, home and small business accounting system that will set up separate accounts for bills and allow you to put a budgeted amount of money into these accounts each pay period. This program also allows you to balance a checkbook, keep track of expenditures, keep track of how much money you can spend on non-budgeted items and interest earnings on money kept in a NOW checking account. Reitz Electronics, Inc., 3170 W. Central Avenue, Toledo, OH 43606, tape $24.95.

Key-264K, a utility program that allows any 32K CoCo to access 64K RAM from BASIC without hardware modifications. Requires Extended or Disk BASIC and good 64K memory chips. Key Color Software, P.O. Box 360, Hardvard, MA 01451, tape $39.95.

Shifter, a 16K talking "munch" game for one or two players. 29 Enterprises, 1208 Country Court, Cary, NC 27511, tape $20.

Alphabet, a 16K ECB educational program designed for pre-school children through first grade. This program teaches the alphabet through letter recognition in and out of sequence by using a variety of exercises. CYBURNET-ICS, 5705 Chesswood Drive, Knoxville, TN 37912, tape $24.95.

C.C. Poker, a 32K ECB five-card draw poker game. Objective: Obtain the best possible poker hand by winning points in proportion to the value of the hand. Ron N. Friesen, #59-9252 Hazel Street, South, Chilliwack, B.C., Canada V2P 5N6, tape $24.95.

The Companion BT-2000 Expansion Interface, a Color Computer bus expander that allows the user to plug in up to five program memory cartridges, then select and operate them one at a time. A "cold start" reset button is available to recover a "locked up" computer without turning power on and off. Basic Technology, 1500 Kent Road, Ortonville, MI 48462, $249.95.

64K Boot/Pager, two ML utility programs. The **64K Boot** allows you to modify BASIC by moving it from ROM to RAM. The **Pager** is a menu-driven utility allowing you to manually page between the 32K banks of memory, copying BASIC or data from one page to the other. The complete assembler source code for both programs is included. Skyline Software, 442 Sunnyside, Wheaton, IL 60187, tape $19.95.

MDISK, a 64K ML utility program that lets you use the upper 32K of memory for rapid storage and retrieval of programs and data. Has the capability to save and load up to 15 programs, view a directory of files stored in page 1, kill unwanted page 1 files, execute BASIC or ML directly from **MDISK** and chain to a BASIC program while preserving data already created. Skyline Software, 442 Sunnyside, Wheaton, IL 60187, tape $27.95, disk $29.95.

Quicksort, a 16K ML utility sort routine program specifically designed to be used by BASIC programmers. This utility will speed up those programs where a BASIC sort is too slow. Skyline Software, 442 Sunnyside, Wheaton, IL 60187, tape $12.95.

Structured Macros, a 32K assembly language programming tool for users of the Macro-80C assembler, by The Micro Works. This program comes close to transforming your assembler into a high-level language. Commands include IF, ELS, ENDIF, IFTST, IFCC, WHILE, ENDWH, REPEAT, and UNTIL. Skyline Software, 442 Sunnyside, Wheaton, IL 60187, disk $19.95.

Motorbike Challenge, a 16K ECB game with nine skill levels. Objective: Drive the motorbike carefully without crashing into obstacles on the bridge in the shortest possible time. Microcom Software, P.O. Box 214, Fairport, NY 14450, tape $14.95.

Romback, a 64K ECB ROM Pack dump utility. Comes with full documentation, including patching instructions to allow several popular "problem" cartridges to run from tape or disk. Skyline Software, 442 Sunnyside, Wheaton, IL 60187, tape $16.95.

Page Plus, a 64K ML utility program that does the memory management necessary to utilize the two 32K banks of memory. Up to 56K available from BASIC programs. Includes documentation and demo programs. Skyline Software, 442 Sunnyside, Wheaton, IL 60187, tape $27.95, disk $29.95.

Pigskin Predictions, a 16/32K ECB NFL Football prediction and analysis program with menu-driven selection of schedules, ratings, division races, and predictions or results by team or week. Seven types of reports to screen or printer (optional) available each week. Rainbow Connection Software, 3514 6th Place, NW, Suite D, Rochester, MN 55901, tape $29.95, disk $32.95.

Face, a 16K ML educational game for ages two and up with synthesized human voice. Objective: Create faces of different shapes and features by inputting different eyes, nose, mouth and hair. More than 10,000 faces possible. Childish Software, P.O. Box 985, Norcross, GA 30071, tape $21.95.

Articulator I, a 16K voice program that will add speech to programs or change dialog in ***Shifter.*** Digitizes your voice from audio tape, sound track may be put on tape as part of other programs. 29 Enterprises, 1208 Country Court, Cary, NC 27511, tape $20.

Super "Color" Speller, a 64K machine-code proofreading program to correct ***Super "Color" Writer*** files. Automatically proofreads documents against a 20,000 word stock dictionary, plus your own customized dictionary. It corrects typos and marks them for special attention. Nelson Software, 9072 Lyndale Avenue, South, Minneapolis, MN 55420, disk $69.95.

Teletutor 1, an educational package of four programs for ages six to adult for the Dragon 32. **Spelling Test,** a program designed to give an oral spelling test using the soundtrack of the tape recorder to dictate either single words or words and sample sentences. **Word Drill,** a program designed to give a multiple choice vocabulary giving of words and their definitions. **Math Drill,** a program designed to help children practice addition, subtraction, multiplication and division in 10 skill levels with a full report at the end of tests. **Estimate,** a program designed to help children practice their mental arithmetic in five skill levels and gives full report of tests. Includes a sealed 17-page instruction binder. Micro Deal, 41 Turo Road, St. Austell, Cornwall, PL25 5JE, tape $25.

Snakes and Ladders, a 16K ECB board-type game for one or two players. Objective: Climb ladders and avoid snakes to reach the top of the 100 block playing board. Microcom Software, P.O. Box 214, Fairport, NY 14450, $14.95.

Girdle the Enemy, a 16K ECB game for one or two players in two skill levels. Objective: Outsmart your opponent by moving up, down, or sideways and surround your opponent's trail with strategy and skill to completely block the way. Microcom Software, P.O. Box 214, Fairport, NY 14450, tape $12.95.

Disk Loader, a program that loads most 16K ML programs from tape to disk. This program takes tape-based ML programs, stores them on disk, and allows them to run automatically. **Disk Loader** is designed to load programs which interfere with normal disk operation. Saves multiple copies, allows renaming the program, and automatically gives program load and execute addresses. Stuart Hawkinson, 6695 SW 203rd Court, Aloha, OR 97007, tape $13.95.

Guardian, a 16K arcade game. Objective: Fire plasma bolts and smart bombs to destroy landers, swarmers, baiters, pulsers and munchies as you protect your ship from destruction. Quasar Animations, 1520 Pacific Beach Drive, San Diego, CA 92109, tape $27.95.

Instrument Flight Simulator, a 32K ECB instrument flight simulator that allows you to take-off, do aerobatics, navigate a course, fly at almost Mach 3, and perform instrument landings. KRT Software, P.O. Box 41395, St. Petersburg, FL 33743, tape $19.95.

Lowercase, a 16/32K program that modifies the printer's existing character set to give true descenders to lowercase characters on the LPVII and DMP100. This program is user transparent and includes CHROUT; a program to modify ML software to use the descenders program. KRT Software, P.O. Box 41395, St. Petersburg, FL 33743, tape $15.95.

Colorware Light Pen, a light pen that plugs directly into the joystick port and is compatible with light pen software. It includes six programs on tape and instructions. Colorware Inc., 78-03 F Jamaica Avenue, Woodhaven, NY 11421, $19.95.

Video*Clear Interference Rejection Cable, a device that connects between the computer and television set and is designed to eliminate or reduce video interference created by the computer. The kit includes the video cable and its filter block, a coaxial "F" connector adapter, a 300 ohm BALUN adapter onnector, and instructions. Computer Associates, 508 4th Avenue, N.W., Riverside, ND 58078, $14.95.

The *Seal of Certification* program is open to all manufacturers of products for the TRS-80 Color Computer, the TDP-100, or the Dragon-32, regardless of whether they advertise in *the Rainbow*. By awarding a *Seal,* the magazine certifies the program *does exist*, but this *does not* constitute any guarantee of satisfaction. As soon as possible, these hardware or software items will be forwarded to *the Rainbow's* reviewers for evaluation.

—Jutta Kapfhammer

CORRECTIONS

Thanks to John Fraysse and Dick White, the gremlin who has been sabotaging our listings has been caught and shown the error of his ways. As many of you have observed, on occasion our program listings have a couple of lines concatenated, or linked together, when *LLISTed* even though when *LISTed* to the screen they print as separate lines.

Examples of this problem include *Rainbow Roach* (June 1983) in which lines 27, 28 and 29 are concatenated. In the same issue, the *Pipeline* game's lines 180 and 190 are run together. In our July issue, the gremlin linked lines 108 and 109 in *Snail.* For August, *Mastermind* was struck, with lines 22 and 23 tied together. There are probably other instances, but, from these, John detected a *modus operandi* for the culprit: It seems that in each instance, the missing carriage return occurs immediately following a BASIC line which is exactly 132 characters long.

Told of this common denominator, our BASIC expert, Dick White, immediately pointed out that on power up the Color Computer *assumes* a printer width of 132 characters and, further, that the line printer will automatically execute a carriage return at 132 columns. Therefore, the line printer width variable (decimal address 155) is initialized at 132, and suppresses any carriage return generated by BASIC at the 132 column point to avoid a double carriage return and a resultant blank line.

To solve our problem, then, we have modified our formatting program for the Epson printer to include a *POKE*155,0 to eliminate the carriage return suppression. Let's hope this also eliminates the problem.

—Jim Reed

Alexander B. Trevor tells us that to enable the DELETE function in the HOMRUN program, (page 88, August 1983) line 1885 must be renumbered to 1895. Also, Sandy says he omitted the file extension of the program as stored on CompuServe; the full file name is HOMRUN.CC [70000,130].

Robert K. Tyson reports that, in his *Strategy Football* (August 1983), a problem will occur in the two-player mode after a touchdown is scored. To eliminate the bug, change lines 358 and 362 as follows:

```
358 IF (BL=1 AND MD=1) OR (MD=2) THEN 376
362 IF (BL=2 AND MD=1)  OR (MD=2) THEN 384
```

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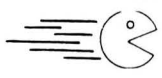
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Upgrading The Shack's Screen Print Program to 32K

By John K. Dayton

I guess like most of us Color Computer owners, the first program I purchased after my printer was the Radio Shack *Screen Print Program.* Of course, back then I had a 16K machine.

Last September, I had a 32K upgrade done. I combined several programs into one large one which was the reason for the memory upgrade. This new program required the *Screen Print Program* from Radio Shack. You know what happened, don't you? I see you out there nodding as if there is some shared knowledge or experience between us.

The *Screen Print Program* resides at the top of RAM for a 16K machine placing it smack in the middle of your new 32K of RAM. The result is that your long programs won't work. It would seem to be a hopeless situation because the *Screen Print* cannot be offset.

I have a resolution to this problem. Let your computer rewrite your copy of *Screen Print* and load it into higher RAM. Here's how to do it:

STEP 1) You must have a copy of Radio Shack's *Screen Print Program.*

STEP 2) Enter the following program:

```
10 CLS
20 FOR I=15744 TO 16376
30 P=PEEK(I)
40 IF P=61 OR P=62 OR P=63 THEN P=P+63
50 POKE I+16128,P
60 NEXT I
70 PRINT "DONE"
```

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STEP 3) With this program in your computer load the Radio Shack *Screen Print Program.* Do not *CLEAR 200,15743* prior to loading and do not *EXEC* the program.

STEP 4) *RUN* the BASIC program above. It will move the *Screen Print Program* to high RAM while correcting it. Do not *EXEC* at this time.

STEP 5) Make a recording, or two, of your new *Screen Print Program.* To do this, set up your recorder to record and key in the following command:

```
CSAVEM "SCPRT",31872,32504,31872
```

STEP 6) Test this new program. Turn off your computer and wait the 15 seconds before turning it back on. Rewind your tape to the beginning of the new version. Type in the following:

```
CLEAR 200,31871
CLOADM "SCPRT"
EXEC
```

Now enter this short program:

```
10 PMODE 4,1:PCLS:SCREEN 1,0
20 FOR I=1 TO10
30 CIRCLE (RND(256)-1),RND(192)-1),RND
   (40)
40 NEXT I
50 GOTO 50
```

Turn on your printer. Press the BREAK key and then press SHIFT up arrow, the screen print command. The printer should print the same picture which is on your screen. If it does not, you will have to redo the entire procedure.

Using The New Version

You may use this new version of the *Screen Print Program* just as you would use the old version except use the following memory locations:

LOADING	CLEAR 200,31871 CLOADM "SCPRT" EXEC
REVERSE PRINTING	POKE 32431,255
NORMAL PRINTING	POKE 32431,0
SUBROUTINE	DEFUSR0 = 31913
SAVING	CSAVEM "SCPRT",31872,32504, 31872

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Copyrighting Your Software Part 2

By Tom Nelson
Rainbow Contributing Editor

This is the second installment of a short series of columns about copyright protection for your software. The first column was devoted to an introduction to copyright law. In this column you will learn the important steps to proper registration of your copyright with the Copyright Office.

Copyright protection exists in a work of software from its inception, provided the proper copyright "legend" has been attached before the software has been "published." You've got to be careful not to "publish" your work without a proper copyright notice, or your software will enter the public domain, and will be usable by anyone without obligation to you.

"Publication" has a special meaning in the copyright area. Section 101 of the Copyright Act of 1976 provides the definition:

> "Publication" is the distribution of copies or phonorecords of a work to the public by sale or other transfer of ownership, or by rental, lease, or lending. The offering to distribute copies or phonorecords to a group of persons for purposes of further distribution, public performance, or public display, constitutes publication. A public performance or display of a work does not of itself constitute publication.

The Act goes on to further define what a public display of a work constitutes.

Obviously you don't want to "publish" your programs without a proper copyright notice. It is not entirely clear how far you may go in having others debug your program or review your program without having published your program. Judging from the definition given above, it is therefore definitely advisable to put a proper notice on your program even before you write it! Although there is a way to cure the unintentional omission of the notice, it is troublesome and not the best way to go about things.

Let's assume that you have not let your program enter the public domain. You still must put a proper copyright notice on your program.

Proper notice is the important element. The notice must contain the the copyright symbol ©, or the word Copyright or the abbreviation Copr., the year of first publication of the program and the name of the owner of the copyright, or a recognizable abbreviation. For example, a book may have the notice:

™Copyright 1983 by Horatio H. Pirate

The copyright symbol ™ should be used if you intend to market your programs in Europe. For programs sold in South America you must also have the phrase: "ALL RIGHTS RESERVED."

Now you know what the notice should say, but the next question is where should it appear? It should be placed both in the program itself and be made to appear when the program is used, for example, each time the program is loaded up. Where the screen will not display the copyright symbol, (C) is an acceptable substitute. In addition, the notice should be conspicuously placed on the packaging. If your program is contained in a ROM chip, a copyright notice should also be in the code in the ROM. Don't forget that your documentation is also copyrightable subject matter, and should have its own copyright notice.



". . . and we will be issuing your copyright certificate to you as soon as our extensive evaluation is complete.

Sincerely,
U.S. Patent Office"

(Tom Nelson was formerly a Special Assistant Attorney General for the State of Minnesota. He currently is General Counsel for Softlaw Corporation, makers of the Super "Color" Library, and of the ColorQuest adventures.)

Proper use of the copyright legend provides you with some but not all copyright protection. If the program is not registered with the Copyright Office within three months from first publication, you are denied some legal remedies for infringements occurring prior to registration.

Once you have properly registered your copyright you are entitled to seek statutory remedies including damages. You are also entitled to obtain court costs and attorney's fees if you are successful. The statutory damages are available if you register any time up to five years after you first publish your work. However, the court cost and attorney fee provision applies only to infringements occurring up to three months after first publication or after registration, if registration occurs after the initial three month period. Thus, if you seek to sue for infringement of your copyright during the three month period after first publication and the three month period has not expired, you may register and if successful in the lawsuit, you may be entitled to court costs and attorney's fees. However, if the three month grace period has ended and you have not registered your copyright, you will not be entitled to court costs and attorney's fees for infringements occurring prior to registration.

So what, you ask? Sure, you can still collect damages. Damages, however, are often minimal compared to the court costs and attorney's fees you incur to enforce your rights. In reality, without the ability to obtain court costs and attorney's fees, you may not be able to afford protecting your copyright. It just costs too much, especially if you are up against a big company which has in-house attorneys who can delay the proceedings for years. The fear of paying attorney's fees and court costs should be a real consideration to anyone thinking of infringing your copyright.

I'll discuss more about remedies later. For now I'll assume that you have concluded that the time has come to register your copyright.

Registration is a formal application process. It requires the completion of the proper forms and transmittal of proper copies of your program. There are two categories under which your programs may be registered: as literary works and as audiovisual displays. These two forms of registration are not separate; both may be used for the same program. Each has a specific purpose. Registration as an audiovisual work applies primarily to video games. Several companies have taken videotapes of the pictorial displays and sound effects of their games as they are played or as they operate in the attract mode between plays, and applied for a copyright for these displays. Recently, several court decisions have upheld the validity of this type of copyright for video games. This type of copyright has proven much more useful to protect against infringers of game copyrights, since this type of copyright protects the exact expression of the game in its display rather than in its programming code.

The copyright for non-dramatic literary expression, on the other hand, provides protection for "readable" code, whether by the human eye or by machine. This is a protection for the original code of your program.

The literary work copyright is the usual one sought. It is, by and large, the only form available for utility and other non-game programs which do not have original or protectible screens. Even game programs are usually registered as literary works since most games are not really going to be the subject of copying. However, if you feel that your game is worth the added expense and trouble, by all means register it as an audiovisual work.

To register literary works you must obtain the form TX from the Copyright Office. You can either obtain it from the Copyright Office itself, or from your local federal office building. The address of the Copyright Office is United States Copyright Office, Library of Congress, Washington, D.C. 20559. The form comes with a detailed explanation sheet for filling it out. The form is self-explanatory and tells you what to do with it when you are done. Some parts of the form may, however, give you some trouble. Let me mention a few points here so that when you get your forms you can refer back to this column to help you fill it out. The portions for your entry of information are numbered, and I will follow those numbers here when making comments.

2) If you wish, you may use a pseudonym when registering the program, or you may register the program as having anonymous authorship. If you do this, however, your copyright protection will be shorter in duration than if you listed your real name, only at least 75 years. Such time periods for microcomputer programs at this stage of computer developments are the equivalent to eternity! Be aware that if you created the program while in the employ of another, the program may have been a "work for hire," and thus the property of the employer and not you. This will have a significant bearing on the ownership of the program. If you have any questions concerning whether your work is a "work



for hire," you should consult a copyright law attorney.

3) The form differentiates between creation and publication. These are different things. The date of creation is when the program was finished in the form for which you are seeking registration. You don't have to publish your program for it to be registered and be afforded full copyright protection.

4) A claimant is a person to whom some right concerning your copyright has been transferred. You must list in space four any persons who have rights in your software, and how they obtained that interest. If there are none, you should put only the author's name. You should be aware that the copyright law specifically provides that no transfer of copyright ownership is valid unless it is in writing, signed by the owner or his or her agent (section 204). Section 205 allows the Copyright Office to record transfer documents. This is done to avoid any future misunderstandings which could arise from multiple transfers of portions of one's copyright rights. To take advantage of this recordation feature while retaining the confidentiality of your agreements you may file a "dummy" agreement stating all the relevant terms merely for the purpose of recording the transfer with the Copyright Office. If you have questions about this, see your attorney.

5) There are three reasons to re-register a piece of software: 1) You are only now applying for registration as author of this work, even though your other co-authors have already done so; 2) You are registering a work which you previously registered when unpublished, and now your program is published; and 3) You are now registering a new version of your program, e.g., *Super Color Writer II* Version 3.0. Each new version of a program should be separately registered to give yourself full protection. The original copyright does not cover later revisions or versions of your program.

Once you have completely filled out the form, you must send it, together with $10 and a copy of your program, to the Copyright Office in order to register your software. This latter requirement is called the "deposit" requirement. It is an issue of much concern to software companies. The fear is that since people can come to the Library of Congress to peruse through documents, they might peruse through your program and steal it. Therefore, software houses are reluctant to submit complete copies of their programs, and many are reluctant to submit source code at all, choosing instead to submit object code, ie, 1s and 0s.

Responding to these concerns, the Copyright Office has developed special procedures for the deposit of software. First, although the Copyright Office would like to have the source code, it will accept object code under a "rule of doubt" if you accompany your deposit with a short letter certifying that your submission is an original work of authorship. The Copyright Office only requires that you send in the first and last twenty-five pages of your program, ie, a printout in binary, hexadecimal or source, and the page on which the copyright notice appears. Those of you who really wish to protect your programs can add twenty-five pages of code to the beginning and the end of your program which are meaningless gibberish.

Those of you who intend to treat your source code as a trade secret, and thus will be sending in the source code, should be sure to have a readable copyright notice on the first page of your code. Those of you writing in BASIC have a different problem since there is no object code to supply. You will have to supply the first and last twenty-five pages of your source, if you have that many.

Registration of your program as an audiovisual work requires that you use Form PA, also available from the Copyright Office. It is very similar to Form TX. However, instead of depositing the first and last twenty-five pages of your program, you would instead deposit a videotape or movie of the screens which you wish to protect. Filing of form PA is not exclusive of filing for registration as a literary work with form TX as well. Be sure to do both.

Now you are on the way to getting your software proper copyright protection. Still, once the Copyright Office has accepted your program and issued your numbered copyright certificate, what have you really got? In my next column I will explore what rights the copyright law gives you and how you can best use them. Until then, get and fill out those forms.

This column is meant to be educational and informative. It is not intended as legal advice. If you should have a legal question you should consult an attorney of your choice.

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Printing Graphic Characters On The Microline 82A

Direct Printing and Using Telewriter-64

By Robert W. Ericson

If you have an older Color Computer (ROM operating system 1.0) and the Microline 82A printer, you probably have shared my frustration in trying to produce graphic characters in a predictable and reliable way. Note: to find which ROM you have, type *EXEC* 41175 and it will appear on your screen. This article presents the techniques of using the full set of graphic characters available and tips on their use for both direct printing *(PRINT #-2,)* and from the keyboard using the *Telewriter-64* word processing system from Cognitec.

The difficulty in using graphic characters lies in the instruction manuals for both the 82A and the *Telewriter-64*. The former gives wrong information and the latter skips over the issue. It was only after many telephone calls and letters to both the vendor (thinking my printer was broken) and to Okidata and a considerable amount of trial and error that I was able to decode the system.

Direct Printing Of Characters

To print graphic characters you must first set the printer into the graphics mode. This is done by typing PRINT #-2, CHR$(14) and ENTER. Nothing seems to happen, but a signal was sent to the 82A putting it into the graphics mode.

Next type PRINT #-2, N, where N is any number between 160 and 223. (The user manual specifies 128—191). This does not apply to ROM version 1.0.) This will print a graphic character on your printer. To develop a reference chart of numbers and graphic characters, enter the program in Listing 1 and *RUN* it.

To return the printer to normal operations you may either turn it off and on again or type PRINT #-2, CHR$(15). This will exit the graphics mode and reset the printer.

Tip 1: You can put the computer in the expanded or condensed mode as well as in the graphics mode. This will, in effect, give you three times the number of graphic characters. For example, put the printer in the expanded character mode (PRINT #-2, CHR$(31)) and run Listing 1. You may also put the printer in the condensed mode (PRINT#-2", CHR$(29)) and run Listing 1.

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"A problem occurs when one enters the graphics mode. There is no instruction to indicate which keys produce which characters. Help has arrived! The chart below is a conversion table of keys to graphic symbols. Note that each capital letter and symbol (including the space bar) creates a graphic character."

Tip 2: If you are using the ROM cartridge Color Scripsit from Tandy Corp., you can have it print in one of the other print styles. For example, to print your Scripsit text in bold: 1) turn on your system—computer and printer; 2) before inserting the ROM cartridge, type PRINT #-2, CHR$(29); 3) turn off the computer (the printer will remain in the bold mode); 4) insert the Scripsit ROM; 5) enter text and *print it* out. Your margins and formatting will be changed.

Listing 1

```
10 FOR X = 160 TO 233
20 PRINT #-2, CHR$(15)X"   = "CHR$(14)CHR$(X)
30 PRINT #-2, CHR$(10)
40 NEXT X
```

Line 10 sets up the program to list all the characters. Line 20 first puts the printer in the normal mode to print the numbers and equal sign, enters the graphic mode and then prints the graphic character. Line 30 is a line feed to give double spacing. Line 40 completes the loop.

Use of the *Telewriter-64*

I assume the reader is familiar with the *Telewriter-64* program and understands the concept of embedded codes. These are adequately explained in the *Telewriter-64* manual. I have found it quite handy to put a standard format of embedded codes at the head of all my word processing. This format is:

```
↑05  10 15 20 25 30
↑D1  30
↑D2  29
↑D3  31
↑D4  29 31
↑D5  27 54
↑D6  27 56
↑D7  14
↑D8  15
↑D9  24
```

(Note: The up arrow is produced by pressing CLEAR and the period symbol together.)

The first line sets a group of tab stops. The embedded codes 1—9 will set the printer to the following modes:

1 Standard
2 Condensed
3 Wide
4 Bold
5 6 Lines per inch
6 8 Lines per inch
7 Graphics mode
8 Clear print buffer

A problem occurs when one enters the graphics mode. There is no instruction to indicate which keys produce which characters. Help has arrived! The chart below is a conversion table of keys to graphic symbols. Note that each capital letter and symbol (including the space bar) creates a graphic character.

To use this feature in the body of your text: 1) press CLEAR and 7 together to enter the graphics mode (after you have defined it as indicated above); 2) enter the letters or symbols of the graphic characters desired; 3) to exit the graphics mode type CLEAR and 1 together.

Tip 3: Use the graphics mode to simulate logos, or make a stylized letterhead.

Tip 4: To get bold print (not extended) put the embedded code on the preceding line.

Tip 5: Draw a worksheet with a 2 x 3 block grid and use it to sketch your design. (If you send $1 and a self-addressed, stamped envelope to the author directly, he will send you a copy of his worksheet. Send to: Robert W. Erickson, 5 Carriage Dr., Acton, Mass., 01720.)

B L A C K J A C K P R O



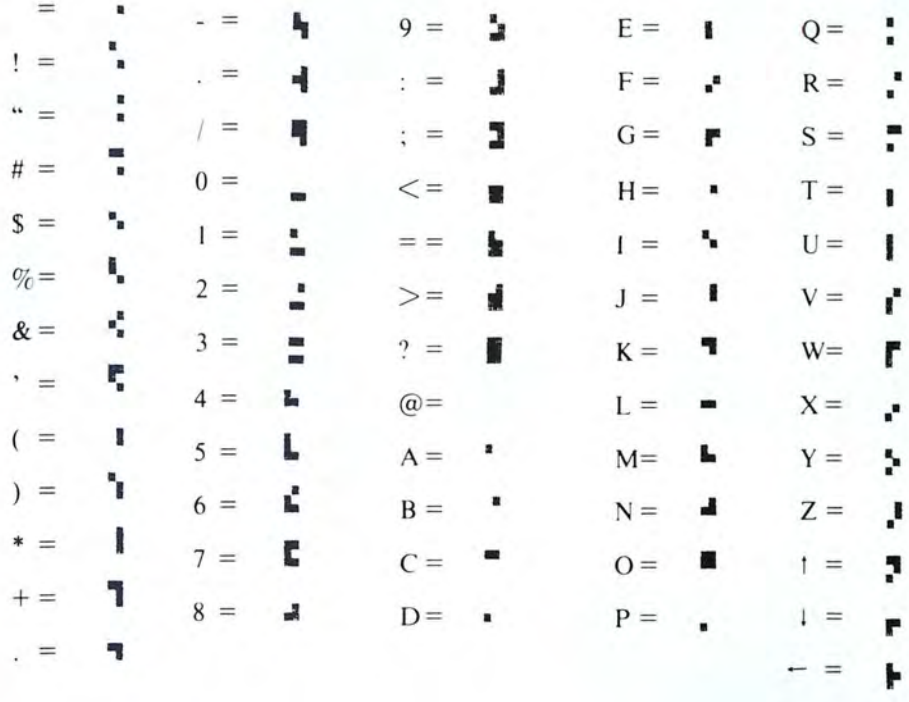
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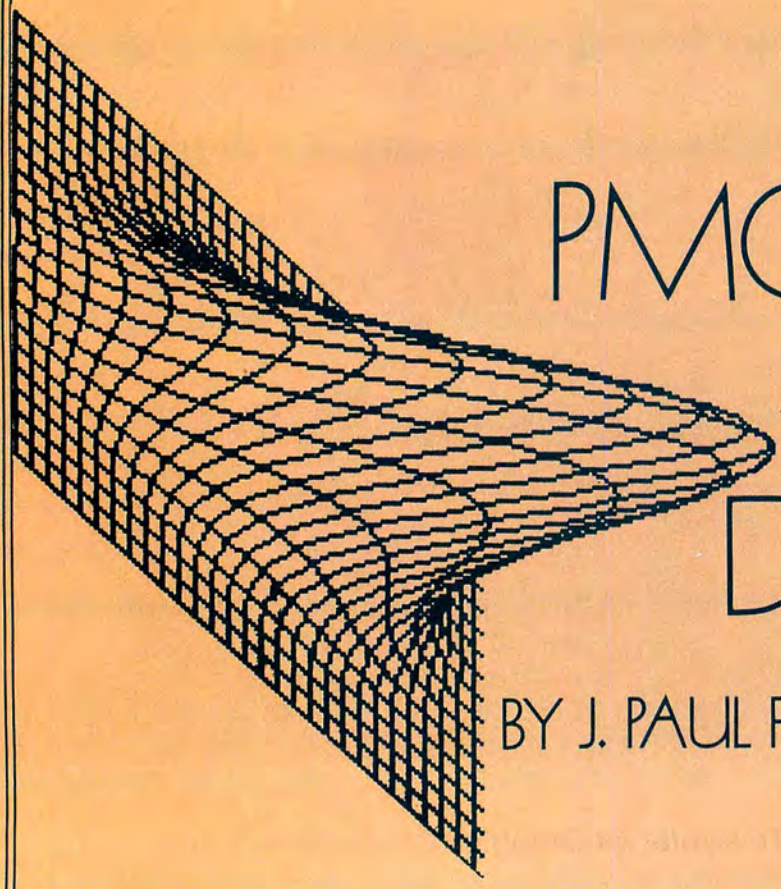
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S K I L L W A R E

Telewriter-64 Graphics Conversion Chart





PMODE 4 GRAPHICS DUMP

BY J. PAUL FOUNTAIN

After seeing the fine job Mr. Kohn did on his *Printout At PMODE4* article (*Rainbow,* July 1983), I realized that we have not seen any program in print that supports the dot addressable capabilities of the TRS line printers. I am about to remedy this situation with the program that follows. It is a machine language routine that will copy a *PMODE4* screen to a TRS-80 Line Printer (mine is a Line Printer VIII) using the dot addressable graphics capability. The routine requires Extended Color BASIC because it uses the graphics page pointer.

Since printing one dot for each screen pixel resulted in such a small image on paper, I decided to double the number of dots both vertically and horizontally. Four dots per pixel lets the printer image cover most of an 8½" x 11" page (approximately the size of a 13" TV screen). In addition, I found it necessary to turn the printed image on its side because the 256 pixels across the *PMODE4* screen results in 512 printer dots, and the printer uses only a 480 dot line.

An editor/assembler must be used to get the code into memory. I will describe the process for Radio Shack's *EDTASM+* since this is the assembler I used.

First, type in the assembly listing. There is no need to type in anything beyond or including the semicolon on each line nor any

(Paul Fountain, a carpenter and part-time farmer, teaches personal computer programming classes at home. He enjoys programming on his 64K CoCo in his spare time.)

line beginning with an asterisk since these are REMarks. Next, assemble in memory with this command: A/IM/AO/WE. The WE switch will stop the assembly if an error is encountered.

When the assembly process yields 00000 ERRORS, the machine code is in memory. Save a copy of the assembly listing to tape using the W command. Now enter ZBUG using the Z command. Finally, save the machine code to tape with this command; PGRAFDUMP 7D8F 7F51 7D90(3D8F 3F51 3D90 for 16K).

You'll notice that all of the variables need not be saved; however, memory must be reserved for them when *CLOADing* the program. The assembled code is relocatable, so it can be loaded using an offset.

This routine may be used as a BASIC USR subroutine or called directly from the keyboard. Reserve memory for the machine code with a CLEAR 200,&H7D7F (&H3D7F for 16K) statement. Then *CLOADM* the machine code into memory. To use the machine code as a subroutine, define the entry point to START1 using this statement: DEFUSR0=&H7DBB(&H3DBB for 16K). Call the subroutine from BASIC with this statement: A=USR0(0).

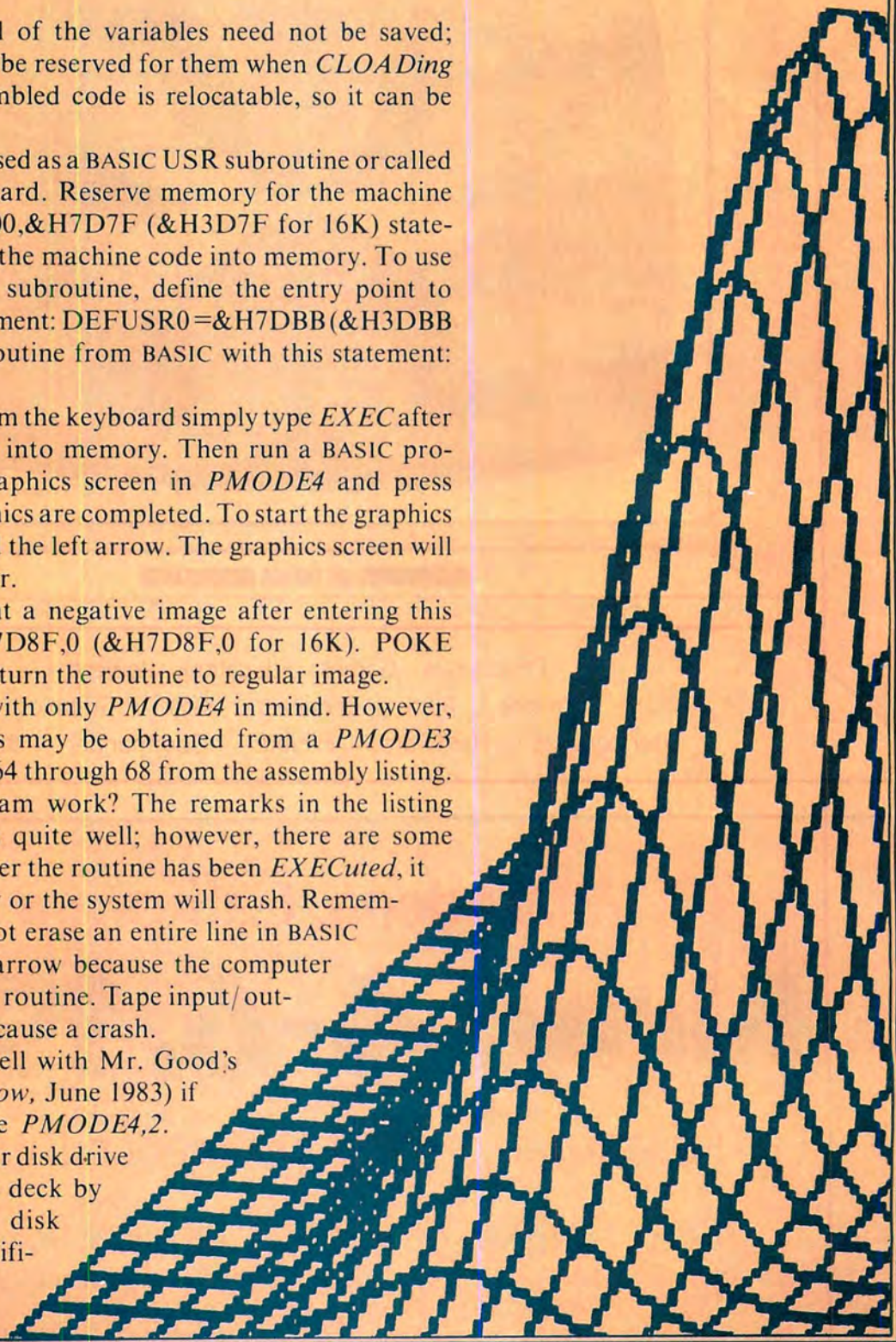
To call the routine from the keyboard simply type *EXEC* after *CLOADMing* the code into memory. Then run a BASIC program that creates a graphics screen in *PMODE4* and press BREAK when the graphics are completed. To start the graphics dump, press SHIFT and the left arrow. The graphics screen will not be sent to the printer.

The routine will print a negative image after entering this statement: POKE &H7D8F,0 (&H7D8F,0 for 16K). POKE &H7D8F,&HFF will return the routine to regular image.

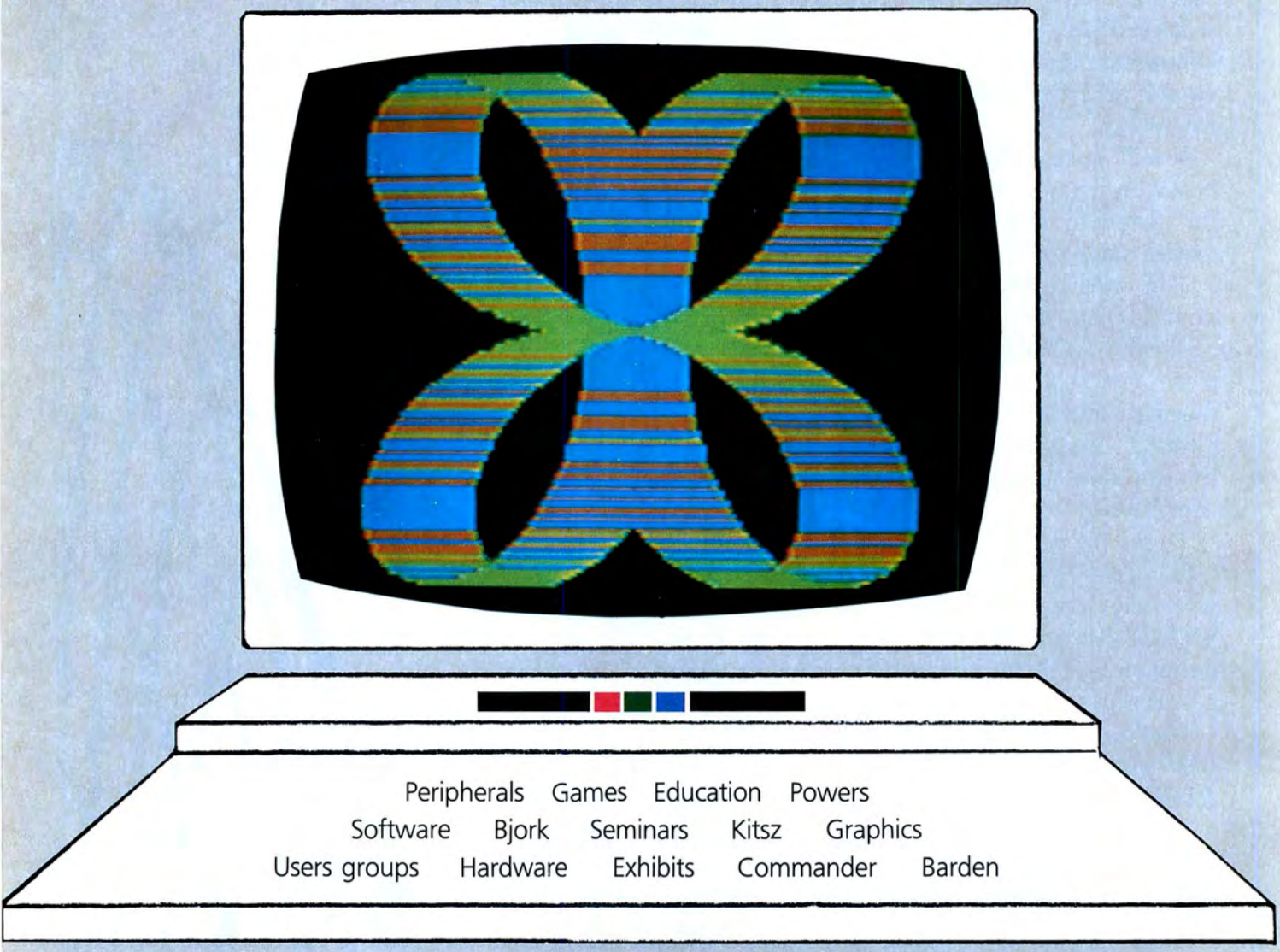
I wrote this routine with only *PMODE4* in mind. However, some interesting results may be obtained from a *PMODE3* screen by deleting lines 64 through 68 from the assembly listing.

How does the program work? The remarks in the listing describe the mechanics quite well; however, there are some cautions to observe. After the routine has been *EXECuted*, it must remain in memory or the system will crash. Remember, too, that you cannot erase an entire line in BASIC using SHIFT and left arrow because the computer will jump instead to this routine. Tape input/output operations will not cause a crash.

The routine works well with Mr. Good's *Printer Spooler (Rainbow,* June 1983) if you *PCLEAR8* and use *PMODE4,2.* Oh yes, you may use your disk drive instead of your cassette deck by using the appropriate disk statements without modification to the routine.



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Listing 1:

```
                        00001
                        00002
                        00003 * DOUBLE SIZE GRAPHICS SCREEN DUMP TO PRINTER
                        00004
                        00005 ********************
                        00006 *        BY        *
                        00007 * J. PAUL FOUNTAIN *
                        00008 * ROUTE 1 BOX 114H *
                        00009 * DENTON, MD 21629 *
                        00010 ********************
                        00011
                        00012 * THIS PRINTER ROUTINE REQUIRES EXTENDED COLOR BASIC
                        00013 * AND WILL PRINT PMODE 4 SCREEN ONLY
                        00014 * THIS ROUTINE USES THE FOLLOWING LP VIII CODES:
                        00015 *       $0D     CARRIAGE RETURN-LINE FEED SEQUENCE
                        00016 *       $12     ENTER GRAPHICS MODE
                        00017 *       $1C     REPEAT DATA
                        00018 *       $1E     END GRAPHICS MODE
                        00019 * THE MOST SIGNIFICANT BIT OF EACH GRAPHICS BYTE
                        00020 * MUST BE SET.  THE OTHER 7 BITS CONTROL ONE
                        00021 * PRINT HEAD WIRE EACH:
                        00022 *       1=PRINT DOT
                        00023 *       0=NO DOT
                        00024
                        00025
7D80                    00026         ORG     $7D80   ;16K ORG $3D80
                        00027
                        00028
        A002            00029 CHROUT  EQU     $A002
7D80                    00030 HOOK    RMB     3
7D83                    00031 PGTOP   RMB     2
7D85                    00032 PGBOT   RMB     2
7D87                    00033 COUNT   RMB     1
7D88                    00034 COUNT1  RMB     1
7D89                    00035 DATA    RMB     1
7D8A                    00036 DATA1   RMB     1
7D8B                    00037 SBYTE   RMB     1
7D8C                    00038 DBYTE   RMB     1
7D8D                    00039 MLTPLY  RMB     1
7D8E                    00040 AND     RMB     1
7D8F    FF              00041 EXCL    FCB     $FF     ;0 FOR NEGATIVE IMAGE
                        00042
                        00043
                        00044 * CHANGE BASICS INPUT RAM HOOK TO VECTOR THROUGH
                        00045 * OUR START ROUTINE EACH TIME BASICS INPUT
                        00046 * ROUTINE IS ENTERED
7D90 34 12              00047 INIT    PSHS    A,X     ;SAVE A AND X REGISTERS
7D92 BE 016B            00048         LDX     $16B    ;GET INPUT RAM HOOK
7D95 AF 8C E9           00049         STX     HOOK+1,PCR ;AND SAVE IT
7D98 30 8D 0000         00050         LEAX    START,PCR ;GET ADDRESS OF PROGRAM
7D9C BF 016B            00051         STX     $16B    ;AND PUT IT IN INPUT RAM HOOK
7D9F 86 7E              00052         LDA     #$7E    ;GET JMP CODE
7DA1 B7 017F            00053         STA     $17F    ;AND PUT IT IN RAM HOOK
7DA4 A7 8C D9           00054         STA     HOOK,PCR ;ALSO IN RETURN VECTOR
7DA7 35 92              00055         PULS    A,X,PC  ;GET A AND X REG. AND RETURN
                        00056
                        00057
                        00058 * IF BASIC IS INPUTING FROM OTHER THAN KEYBOARD
                        00059 * THEN RETURN TO BASIC
                        00060 * IF NOT PMODE 4 THEN RETURN TO BASIC
                        00061 * IF INPUT CHARACTER IS NOT $15 THEN RETURN TO BASIC
7DA9 0D 6F              00062 START   TST     $6F     ;DOES DEVNUM POINT TO KEYBOARD
7DAB 26 D3              00063         BNE     HOOK    ;IF NO THEN RETURN
7DAD 34 02              00064         PSHS    A       ;SAVE A REGISTER
7DAF 96 B6              00065         LDA     $B6     ;GET PMODE
7DB1 81 04              00066         CMPA    #$4     ;IS IT PMODE 4
7DB3 35 02              00067         PULS    A       ;RESTORE A
7DB5 26 C9              00068         BNE     HOOK    ;AND RETURN IF NO
7DB7 81 15              00069         CMPA    #$15    ;IS INP CHAR SHIFT LEFT ARROW
7DB9 26 C5              00070         BNE     HOOK    ;RETURN IF NO
                        00071
                        00072
                        00073 * INITIALIZE VARIABLES
                        00074 * COMPUT GRAPHICS SCREEN ADDRESS LIMITS
                        00075 * SET DEVICE NUMBER TO PRINTER
7DBB 86 FF              00076 START1  LDA     #$FF    ;  ****************
7DBD A7 8C CE           00077         STA     AND,PCR ;  * INITIALIZE   *
7DC0 6F 8C C9           00078         CLR     DBYTE,PCR ; *             *
7DC3 86 80              00079         LDA     #$80    ;  * SUBROUTINE   *
7DC5 A7 8C C1           00080         STA     DATA,PCR ;  *             *
7DC8 6F 8C BC           00081         CLR     COUNT,PCR ; * VARIABLES   *
7DCB 86 01              00082         LDA     #1      ;  *             *
7DCD A7 8C BD           00083         STA     MLTPLY,PCR ;****************
7DD0 86 FE              00084         LDA     #-2     ;LET DEVNUM POINT
7DD2 97 6F              00085         STA     $6F     ;TO PRINTER
7DD4 86 12              00086         LDA     #$12    ;SEND CODE TO PRINTER
7DD6 AD 9F A002         00087         JSR     [CHROUT] ;FOR GRAPHICS MODE
7DDA 9E BA              00088         LDX     $BA     ;GET ADDRESS OF GRAPHICS PAGE
7DDC 30 88 1F           00089         LEAX    $1F,X   ;POINT TO UPPER RIGHT CORNER
7DDF AF 8C A1           00090         STX     PGTOP,PCR ;AND SAVE IT
7DE2 30 89 17E0         00091         LEAX    $17E0,X ;POINT TO LOWER RIGHT CORNER
7DE6 AF 8C 9C           00092         STX     PGBOT,PCR ;AND SAVE IT
7DE9 108E 0001          00093         LDY     #1      ;USE Y TO COUNT COLUMNS
                        00094
                        00095
                        00096 * MAIN ROUTINE CALLS SUBROUTINES IN PROPER SEQUENCE
                        00097 * AND KEEPS SCREEN ADDRESS POINTERS UPDATED
                        00098 * IT ALSO WATCHES FOR END OF SCREEN
7DED 8D 6C              00099 L2      BSR     MARGIN  ;CENTER THE PRINTOUT
7DEF AE 8C 91           00100         LDX     PGTOP,PCR ;GET STARTING POINT
7DF2 17 0088            00101 L3      LBSR    GETBT   ;GO GET MEMORY BYTE
7DF5 17 0114            00102         LBSR    CMPUT1  ;GO CONVERT IT TO PRINTER BYTE
7DF8 17 0095            00103         LBSR    PRT     ;AND SEND IT TO PRINTER
7DFB 30 88 20           00104         LEAX    $20,X   ;POINT TO NEXT BYTE IN COLUMN
7DFE AC 8C 84           00105         CMPX    PGBOT,PCR ;IS THIS BOTTOM OF SCREEN
7E01 2F EF              00106         BLE     L3      ;NO, THEN DO IT AGAIN
7E03 86 0D              00107         LDA     #$0D    ;YES, THEN SEND
7E05 AD 9F A002         00108         JSR     [CHROUT] ;RETURN CHARACTER
7E09 8D 50              00109         BSR     MARGIN  ;DON'T FORGET THE MARGIN
7E0B AE 8D FF74         00110         LDX     PGTOP,PCR ;POINT TO TOP OF SCREEN AGAIN
7E0F 9C BA              00111         CMPX    $BA     ;IS THIS LAST COLUMN
7E11 2D 5B              00112         BLT     LAST    ;YES, GET LAST SNGLE BIT COLMN
7E13 8D 68              00113 L4      BSR     GETBT   ;IT TAKES TWO PRINTHEAD
7E15 17 0133            00114         LBSR    CMPUT2  ;PASSES TO EQUAL ONE COLUMN
7E18 8D 76              00115         BSR     PRT     ;OF SCREEN BYTES....
7E1A 30 88 20           00116         LEAX    $20,X   ;ALMOST
7E1D AC 8D FF64         00117         CMPX    PGBOT,PCR ;IS IT END OF 2ND PRNT PASS
7E21 2F F0              00118         BLE     L4      ;NO, THEN GO AGAIN
7E23 86 0D              00119         LDA     #$0D    ;YES, SEND RETURN CHARACTER
```


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```
7E25 AD   9F A002  00120        JSR    [CHROUT] ;AGAIN, PHEW!!!
7E29 AE   8D FF56  00121        LDX    PGTOP,PCR ;POINT TO TOP AGAIN
7E2D 9C   BA       00122        CMPX   $BA      ;ARE WE TO THE LEFT EDGE YET
7E2F 2D   45       00123        BLT    DONE     ;YES, THEN QUIT
7E31 31   21       00124        LEAY   1,Y      ;NO, THEN INC COLUMN COUNT
7E33 108C 0008     00125        CMPY   #8       ;IS IT THE 8TH COLUMN
7E37 2F   0C       00126        BLE    L8       ;NO, THEN SKIP 3 INSTRUCTIONS
7E39 108E 0001     00127        LDY    #1       ;YES, THEN SET COLMN COUNT TO 1
7E3D 6C   8D FF43  00128        INC    PGTOP+1,PCR ;7 SCRN BYTE COLMNS EQU'S
7E41 6C   8D FF41  00129        INC    PGBOT+1,PCR ;16 PRINTHEAD PASSES
7E45 AE   8D FF3A  00130 L8     LDX    PGTOP,PCR ;GET TOP OF THAT COLUMN AGAIN
7E49 30   1F       00131        LEAX   -1,X     ;THEN GO LEFT TO NEXT COLUMN
7E4B AF   8D FF34  00132        STX    PGTOP,PCR ;AND SAVE IT
7E4F AE   8D FF32  00133        LDX    PGBOT,PCR ;WE HAVE TO DEC THE
7E53 30   1F       00134        LEAX   -1,X     ;BOTTOM POINTER TOO
7E55 AF   8D FF2C  00135        STX    PGBOT,PCR ;AND SAVE IT
7E59 20   92       00136        BRA    L2       ;WE HAVE TO DO IT ALL AGAIN!!!
                   00137
                   00138
                   00139 * LEAVE RIGHT MARGIN, SO THAT PRINTOUT
                   00140 * WILL BE CENTERED
7E5B 86   1C       00141 MARGIN LDA    #$1C     ;GET PRINTER REPEAT CODE
7E5D AD   9F A002  00142        JSR    [CHROUT] ;AND SEND IT
7E61 86   2F       00143        LDA    #47      ;GET BLANK DOT COLMN COUNT
7E63 AD   9F A002  00144        JSR    [CHROUT] ;AND SEND THAT TO PRINTER
7E67 86   80       00145        LDA    #$80     ;WE HAVE TO TELL IT THAT
7E69 AD   9F A002  00146        JSR    [CHROUT] ;THESE ARE BLANKS TO REPEAT
7E6D 39            00147        RTS             ;DONE THAT LITTLE JOB
                   00148
                   00149
                   00150 * WHEN LEFT COLUMN OF PIXELS REMAINS "AND"
                   00151 * MASKS OFF ALL BUT THESE BITS IN THE PRT ROUTINE
7E6E 86   81       00152 LAST   LDA    #$81     ;THIS IS A MASK TO GET ONLY THE
7E70 A7   8D FF1A  00153        STA    AND,PCR  ;LEFT MOST COLUMN OF BITS
7E74 20   9D       00154        BRA    L4       ;GO BACK, BUT SEE PRT FOR AND
                   00155
                   00156
                   00157 * END GRAPHICS MODE AND RETURN TO BASIC
7E76 86   1E       00158 DONE   LDA    #$1E     ;SEND END OF GRAPHICS TO
7E78 AD   9F A002  00159        JSR    [CHROUT] ;THE PRINTER
7E7C 39            00160        RTS             ;THAT WAS FUN-NOW BACK TO BASIC
                   00161
                   00162
                   00163 * GET 2 BYTES FROM SCREEN AND SHIFT THEM TO THE
                   00164 * LEFT, UNTIL THE BITS WE WANT ARE ALL IN ONE
                   00165 * BYTE IN THE A REGISTER
7E7D 1F   20       00166 GETBT  TFR    Y,D      ;Y ALSO HOLDS THE ROL COUNT
7E7F E7   8D FF05  00167        STB    COUNT1,PCR ;IN ITS 8 LSBITS
7E83 EC   84       00168        LDD    ,X       ;GET THE BYTE
7E85 6A   8D FEFF  00169 L6     DEC    COUNT1,PCR ;COUNT DOWN FOR THE ROL'S
7E89 27   04       00170        BEQ    L7       ;BUT SKIP THEM ON FIRST COLUMN
7E8B 59            00171        ROLB            ;SHIFT THE BITS WE NEED
7E8C 49            00172        ROLA            ;INTO THE A REGISTER AND
7E8D 20   F6       00173        BRA    L6       ;GO BACK UNTIL THEIR THERE
7E8F 39            00174 L7     RTS             ;THEN RETURN WITH THE ANSWER
                   00175
                   00176
                   00177 * COUNT THE NUMBER OF UNINTERUPTED IDENTICAL BYTES
                   00178 * FOR REPEAT CODE
                   00179 * AS SOON AS A DIFFERENT BYTE IS ENCOUNTER, THEN
                   00180 * PRINT THE IDENTICAL ONES
7E90 A8   8D FEFB  00181 PRT    EORA   EXCL,PCR ;MAYBE IT'S NEGATIVE IMAGE?
7E94 8A   80       00182        ORA    #$80     ;LEFTMOST BIT MUST BE SET
7E96 A4   8D FEF4  00183        ANDA   AND,PCR  ;ONE LINE DOTS ON LAST PASS
7E9A A7   8D FEEC  00184        STA    DATA1,PCR ;SAVE THE PRINTER DATA BYTE
7E9E 6C   8D FEE5  00185        INC    COUNT,PCR ;AND COUNT THE LIKE ONES
7EA2 A1   8D FEE3  00186        CMPA   DATA,PCR ;UNTIL ONE IS DIFFERENT
7EA6 26   0F       00187        BNE    OUT      ;THEN PRINT THE LIKE ONES
7EA8 E6   8D FEDB  00188        LDB    COUNT,PCR ;DO'NT LET THERE BE MORE
7EAC C1   80       00189        CMPB   #$80     ;THAN 128 LIKE BYTES
7EAE 27   07       00190        BEQ    OUT      ;THEN PRINT THEM
7EB0 AC   8D FED1  00191        CMPX   PGBOT,PCR ;AND IF IT'S THE LAST BYTE IN
7EB4 2C   01       00192        BGE    OUT      ;THE COLUMN, PRINT THEM
7EB6 39            00193        RTS             ;ELSE GO BACK FOR NEXT BYTE
                   00194
                   00195 * THIS ROUTINE IS PART OF THE PRT SUBROUTINE
                   00196 * IT SENDS REPEAT CODE, NUMBER OF TIMES TO REPEAT
                   00197 * AND WHAT TO REPEAT
7EB7 E6   8D FECC  00198 OUT    LDB    COUNT,PCR ;IF COUNT IS 0 THEN THERE'S
7EBB 5D            00199        TSTB            ;1 BYTE OF DATA-SO WE'LL
7EBC 27   40       00200        BEQ    OUT1     ;USE THE OTHER ROUTINE
7EBE 86   1C       00201        LDA    #$1C     ;ELSE SEND THE REPEAT
7EC0 AD   9F A002  00202        JSR    [CHROUT] ;CODE TO THE PRINTER
7EC4 A6   8D FEBF  00203        LDA    COUNT,PCR ;THEN THE NUMBER OF TIMES TO
7EC8 34   02       00204        PSHS   A        ;REPEAT  AND REMEMBER OUR
7ECA AB   E0       00205        ADDA   ,S+      ;PRINTOUT IS DOUBLE SIZE
7ECC AD   9F A002  00206        JSR    [CHROUT] ;SO DOUBLE THE DATA
7ED0 A6   8D FEB5  00207        LDA    DATA,PCR ;THEN SEND THE BYTE THAT'S
7ED4 AD   9F A002  00208        JSR    [CHROUT] ;TO BE REPEATED
7ED8 6F   8D FEAB  00209        CLR    COUNT,PCR ;THEN START THE COUNT AT 0
7EDC AC   8D FEA5  00210 L15    CMPX   PGBOT,PCR ;IS IT BOTTOM OF SCREEN
7EE0 2D   13       00211        BLT    L14      ;IF NOT THEN SKIP
7EE2 A6   8D FEA4  00212        LDA    DATA1,PCR ;OTHER WISE PRINT THAT
7EE6 AD   9F A002  00213        JSR    [CHROUT] ;LAST BYTE
7EEA AD   9F A002  00214        JSR    [CHROUT] ;TWICE
7EEE 86   80       00215        LDA    #$80     ;AND PUT A BLANK
7EF0 A7   8D FE95  00216        STA    DATA,PCR ;BACK IN DATA
7EF4 39            00217        RTS             ;THEN RETURN TO MAIN ROUTINE
7EF5 A6   8D FE91  00218 L14    LDA    DATA1,PCR ;PUT THE DIFFERENT BYTE
7EF9 A7   8D FE8C  00219        STA    DATA,PCR ;FOR START OF ANOTHER COUNT
7EFD 39            00220        RTS             ;THEN GO BACK FOR NEXT BYTE
                   00221
                   00222 * THIS ROUTINE IS ALSO PART OF THE PRT SUBROUTINE
                   00223 * IT SENDS EACH DATA BYTE, THAT IS NOT IDENTICAL
                   00224 * TO ANOTHER, TO THE PRINTER
7EFE A6   8D FE87  00225 OUT1   LDA    DATA,PCR ;WE'LL PRINT THAT SINGLE
7F02 AD   9F A002  00226        JSR    [CHROUT] ;DATA BYTE
7F06 AD   9F A002  00227        JSR    [CHROUT] ;TWICE
7F0A 20   D0       00228        BRA    L15      ;THEN CHECK FOR SCREEN BOTTOM
                   00229
                   00230
                   00231 * GET BYTE FROM GETBT SUBROUTINE AND CHANGE HALF
                   00232 * OF IT INTO A WHOLE BYTE IN THE A REGISTER
                   00233 * BY MAKING TWO BITS FROM EACH SINGLE BIT
7F0C A7   8D FE7B  00234 CMPUT1 STA    SBYTE,PCR ;STORE OUR RAW BYTE
7F10 A4   8D FE79  00235        ANDA   MLTPLY,PCR ;SAVE ONE BIT AT A TIME
7F14 E6   8D FE75  00236        LDB    MLTPLY,PCR ;AND SHIFT TO ITS
7F18 3D            00237        MUL             ;CORRECT POSITION
7F19 68   8D FE70  00238        LSL    MLTPLY,PCR ;THEN GET READY FOR NEXT BIT
7F1D 1F   98       00239        TFR    B,A      ;TRANSFER RESULT FROM B TO A
```


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```
7F1F 58          00240          LSLB           ;MULTIPLY B TIMES 2 AND
7F20 34  04      00241          PSHS   B       ;ADDING IT TO A
7F22 AB  E0      00242          ADDA   ,S+     ;WILL MAKE 2 BITS FROM 1
7F24 AB  8D FE64 00243          ADDA   DBYTE,PCR ;THEN SAVE THESE TWO BITS
7F28 A7  8D FE60 00244          STA    DBYTE,PCR ;IN DBYTE WITH THE REST
7F2C A6  8D FE5D 00245          LDA    MLTPLY,PCR ;IF WE DID IT FOUR TIMES
7F30 81  08      00246          CMPA   #8      ;THEN MLTPLY EQUALS 16
7F32 2F  11      00247          BLE    L13     ;AND WE DROP ON THROUGH
7F34 6F  8D FE55 00248          CLR    MLTPLY,PCR ;INITIALIZE MLTPLY TO
7F38 6C  8D FE51 00249          INC    MLTPLY,PCR ;ONE AGAIN
7F3C A6  8D FE4C 00250          LDA    DBYTE,PCR ;PUT ANSWER IN A REGISTER
7F40 6F  8D FE48 00251          CLR    DBYTE,PCR ;AND THEN CLEAR SCRATCH BYTE
7F44 39          00252          RTS            ;AND RETURN READY TO PRINT
7F45 A6  8D FE42 00253 L13      LDA    SBYTE,PCR ;IF NOT DONE GET RAW BYTE
7F49 20  C1      00254          BRA    CMPUT1  ;AND GO BACK FOR NEXT BITS
                 00255
                 00256
                 00257 * THIS SUBROUTINE PRECEEDS THE CMPUT1 SUBROUTINE
                 00258 * WHEN WE ARE EXTRACTING THE SECOND DATA BYTE
                 00259 * FROM A SCREEN BYTE
                 00260 * IT SHIFTS THE SCREEN BYTE TO THE RIGHT SO THAT
                 00261 * WE CAN WORK ON ONLY THE LEFT PART OF IT
7F4B 44          00262 CMPUT2  LSRA            ;WE'LL SHIFT OUR RAW
7F4C 44          00263         LSRA            ;BYTE OVER THREE TIMES
7F4D 44          00264         LSRA            ;FOR SECOND PRINTHEAD PASS
7F4E 8D  BC      00265         BSR    CMPUT1  ;THEN GO COMPUTE BITS
7F50 44          00266         LSRA            ;THEN SHIFT AWAY THAT BIT
7F51 39          00267         RTS             ;AND RETURN READY TO PRINT
       0000      00268         END
00000 TOTAL ERRORS
```

170	018F
270	0386
390	05E4
END	08C3

Listing 2:

```
10 'AFTER YOU RUN THIS PROGRAM
20 'SAVE TO TAPE WITH THIS
30 'COMMAND:
40 'CSAVEM"GRAFDUMP",32143,32593
,32144
50 'FOR 16K:
60 'CSAVEM"GRAFDUMP",15759,16209
,15760
70 'FOR DISK USE SAVEM COMMAND
80 'FOR 16K LINES 130 AND 140
90 'SHOULD READ AS FOLLOWS:
100 '   5 CLEAR 200,15743
110 '   6 FOR X=15759 TO 16209
120 '
130 CLEAR 200,32127
140 FOR X=32143 TO 32593
150 READ Y
160 POKE X,Y
170 NEXT X
180 DATA 255,52,18,190,1,107,175
,140,233,48,141,0,13
190 DATA 191,1,107,134,126,183,1
,127,167,140,217,53
200 DATA 146,13,111,38,211,52,2,
150,182,129,4,53,2,38
210 DATA 201,129,21,38,197,134,2
55,167,140,206,111,140
220 DATA 201,134,128,167,140,193
,111,140,188,134,1,167
230 DATA 140,189,134,254,151,111
,134,18,173,159,160
240 DATA 2,158,186,48,136,31,175
,140,161,48,137,23,224
```


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```
250 DATA 175,140,156,16,142,0,1,
141,108,174,140,145
260 DATA 23,0,136,23,1,20,23,0,1
49,48,136,32,172,140
270 DATA 132,47,239,134,13,173,1
59,160,2,141,80,174
280 DATA 141,255,116,156,186,45,
91,141,104,23,1,51,141
290 DATA 118,48,136,32,172,141,2
55,100,47,240,134,13
300 DATA 173,159,160,2,174,141,2
55,86,156,186,45,69
310 DATA 49,33,16,140,0,8,47,12,
16,142,0,1,108,141,255
320 DATA 67,108,141,255,65,174,1
41,255,58,48,31,175
330 DATA 141,255,52,174,141,255,
50,48,31,175,141,255
340 DATA 44,32,146,134,28,173,15
9,160,2,134,47,173,159
350 DATA 160,2,134,128,173,159,1
60,2,57,134,129,167
360 DATA 141,255,26,32,157,134,3
0,173,159,160,2,57,31
370 DATA 32,231,141,255,5,236,13
2,106,141,254,255,39
380 DATA 4,89,73,32,246,57,168,1
41,254,251,138,128,164
390 DATA 141,254,244,167,141,254
,236,108,141,254,229
400 DATA 161,141,254,227,38,15,2
30,141,254,219,193,128
410 DATA 39,7,172,141,254,209,44
,1,57,230,141,254,204
420 DATA 93,39,64,134,28,173,159
,160,2,166,141,254,191
430 DATA 52,2,171,224,173,159,16
0,2,166,141,254,181
440 DATA 173,159,160,2,111,141,2
54,171,172,141,254,165
450 DATA 45,19,166,141,254,164,1
73,159,160,2,173,159
460 DATA 160,2,134,128,167,141,2
54,149,57,166,141,254
470 DATA 145,167,141,254,140,57,
166,141,254,135,173
480 DATA 159,160,2,173,159,160,2
,32,208,167,141,254
490 DATA 123,164,141,254,121,230
,141,254,117,61,104
500 DATA 141,254,112,31,152,88,5
2,4,171,224,171,141
510 DATA 254,100,167,141,254,96,
166,141,254,93,129,8
520 DATA 47,17,111,141,254,85,10
8,141,254,81,166,141
530 DATA 254,76,111,141,254,72,5
7,166,141,254,66,32
540 DATA 193,68,68,68,141,188,68
,57
```

Listing 3:

```
100 ......04D5
260 ......0626
END .....078F
```

```
5 'EXP
10 'THIS PROGRAM DRAWS A
20 '3-DIMENSIONAL VIEW OF THE
30 'FUNCTION EXP(X^2+Y^2)
40 CLS
50 INPUT"GRAPH FROM PROGRAM OR M
FILE (P  OR M)";AC$
60 IF AC$="M" THEN 420
70 DIM M(256,1)
80 PMODE 4,1
90 PCLS1
100 SCREEN 1,0
110 A=0:B2=0:C2=0
120 FOR Y=2.2 TO -2.4 STEP -.16
130 B2=0:C2=0
140 FOR X=-3 TO 3 STEP .06
150 GOSUB 200
160 NEXT X
170 A=A+4
180 NEXT Y
190 GOTO 330
200 Z=EXP(-(X^2+Y^2))*5.25
210 B1=X*20+60+A:C1=(Y-Z)*25+136
220 IF M(B1,1)=0 AND M(B1,0)=0 T
HEN M(B1,1)=C1:M(B1,0)=C1
230 IF C1>=M(B1,0)THEN M(B1,0)=C
1:GOTO 270
240 IF C1<=M(B1,1)THEN M(B1,1)=C
1:GOTO 270
250 B2=0:C2=0
260 GOTO 280
270 GOSUB 290
280 RETURN
290 IF B2=0 AND C2=0 THEN 310
300 LINE(B2,C2)-(B1,C1),PRESET
310 B2=B1:C2=C1
320 RETURN
330 FOR X=0 TO 256:FOR Y=0 TO 1:
M(X,Y)=0:NEXT Y,X
340 FOR X=3 TO -3 STEP -.3
350 A=0:B2=0:C2=0
360 FOR Y=2.2 TO -2.4 STEP -.04
370 GOSUB 200
380 A=A+1
390 NEXT Y
400 NEXT X
410 GOTO 410
420 PMODE 4,1
430 PCLS1
440 SCREEN 1,0
450 AD=(256*PEEK(&HBA)+PEEK(&HBB
))-&HE00
460 IF AD<0 THEN AD=&HFFFF+AD+1
470 CLOADM"SCREEN",AD
480 GOTO 480
```

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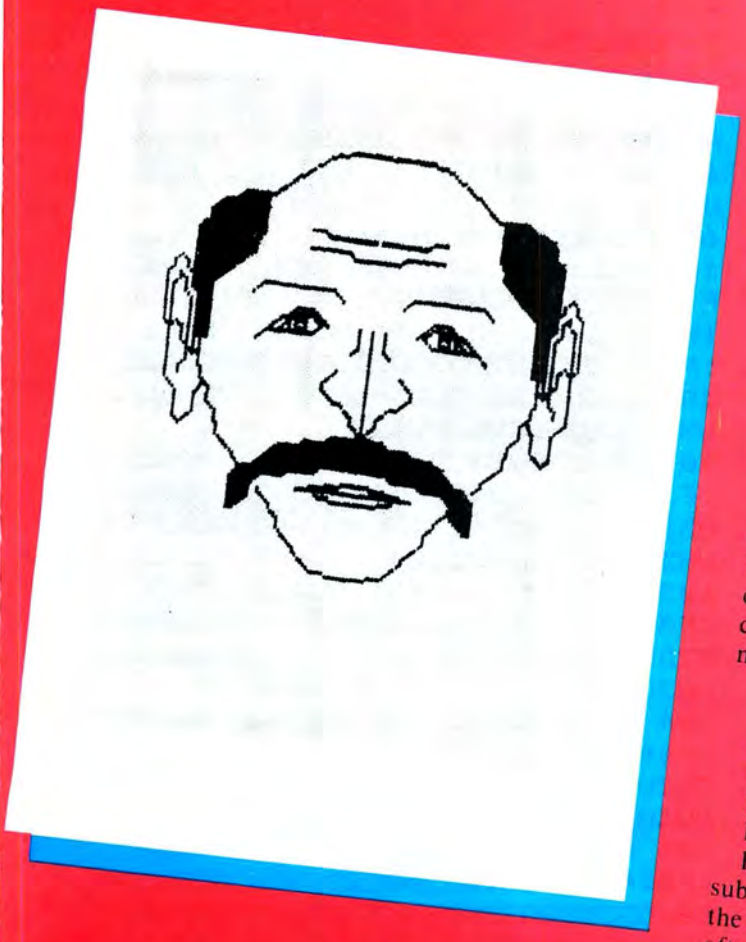
Picture Your Face

By D. and R. Delbourgo

For many years it has become standard practice for police departments (not to mention more secretive organizations) to use an *Identikit* so as to build up a complete face of a suspect by adding one feature to the next as the identification details come in.

You can also try to "photofit" on your TRS-80C, although it must be admitted that the memory available places a strong limitation on the variety of faces that are sketchable with the computer. Even though the listing at the end consumes a full 20K of memory—typists beware!—it shows what can be done on your trusty CoCo.





The program is self-prompting but we should draw your attention to the particular features: LONG HAIR, SPECTACLES, BEARDS, MOUSTACHES, LINES/WRINKLES. If one or other of these is not needed at any given stage (for instance you might be drawing a young boy with good eyesight), simply press "C" to continue.

Also we should warn you not to enlarge or move around to any great extent these features: FACE SHAPES, HAIRSTYLES, LONG HAIR, BEARDS (except as specified), MOUSTACHES. Otherwise we stand in danger of painting incorrectly, with disastrous results!

When you have finished your picture, those of you with printers can transfer your *magnum opus* to paper. The examples alongside indicate the kind of thing you can achieve with a little care. Of course, you may also construct the most outlandish caricatures by enlargement and funny placements of each feature.

A few remarks about the program itself:

Lines 1—10 produce the title card.

Lines 40—64 give the directions.

Lines 100—336 provide the feature choices.

Lines 340—347 allow you to print and rerun.

Lines 600—611 contain the drawing subroutine.

Really, the heart of the program lies in the drawing subroutine, which, you will observe, allows you to shift the features about (subject to painting limitations thereafter) and rescale them (to a maximum and minimum).

The printing routine is in BASIC and is awfully slow; but it was either that or injecting an ML routine with a vast collection of *DATA* statements, and, thinking how outfaced you would already be with typing in the main program, we decided to stick to slow but wordeconomical BASIC.

We are not especially proud of our drawings, but our program is so devised that those of you with artistic flair can easily change our string statements and get more accomplished results. Also, it ought to be possible to modify our program quite easily to get a cartoon version of *Identikit*. Have fun with it in the meantime.

40	022D	212	1A30
64	053E	233	1D6C
112	0846	260	219D
125	0BDA	280	2550
144	0FA0	294	28D4
167	1352	320	2BFA
185	16E7	341	2F20
		END	31EC

The listing:

```
1 CLEAR100
2 CLS4:FORK=0TO11:FORJ=0TO14:POK
E1097+J+32*K,159:NEXTJ,K:POKE122
4,159:POKE1240,159:POKE1320,159:
POKE1336,159:POKE1417,191:POKE14
31,191:POKE1449,191:POKE1450,191
:POKE1462,191:POKE1463,191:POKE1
461,191:POKE1451,191
3 FORK=0TO160STEP32:POKE1097+K,1
28:POKE1111+K,128:NEXTK:FORK=10T
022:POKE1088+K,128:NEXTK:POKE113
0,128:POKE1142,128
4 FORK=0TO3:POKE1195+K,147:POKE1
202+K,147:NEXTK
5 POKE1229,175:POKE1236,175:POKE
1228,207:POKE1235,207
6 POKE1256,154:POKE1288,154:POKE
1272,149:POKE1304,149
9 PRINT@108,"identikit";:PRINT@2
40,"b";:PRINT@272,"y";:PRINT@303
```

```
,"r&d";:PRINT@364,"delbourgo";
10 PLAY"O1L6DL8EL3FL4AL6DL8EL3FL
4AL6DL8EL4FL8GL6AL10FGAL4A#O2D":
FORT=1TO500:NEXTT
40 PMODE4,1:PCLS1:SCREEN1,1
50 CLS:PRINT"  *** IDENTIKIT  PR
OCEDURE ***":PRINT
52 PRINT" YOU WILL BE ASKED TO D
RAW THE    FOLLOWING FEATURES IN
THE        FOLLOWING ORDER:-":PRI
NT
54 PRINT" face-shape, hairstyle,
 ears,     eye-brows, eyes, nose,
 mouth,    long hair, spectacles,
 beard,    moustaches, lines/wrin
kles.":PRINT
56 PRINT" AT EACH STAGE OF THE P
ROCEDURE  YOU WILL BE PRESENTED
WITH A     SELECTION OF EACH FEAT
URE.":PRINT:PRINT"     HIT ANY KE
Y TO CONTINUE     ";
57 IFINKEY$=""THEN57
58 CLS:PRINT:PRINT" AFTER MAKING
 YOUR SELECTION,     USE ARROW KE
YS TO MOVE EACH      FEATURE AROU
ND.":PRINT
60 PRINT"  PRESS <e> TO ENLARGE,
":PRINT"  PRESS <s> TO SHRINK.":
PRINT:PRINT" AFTER DRAWING, PRES
S <c> TO      CONTINUE TO THE NEX
T FEATURE     OR <r> TO RETURN TO
 THE MENU     FOR ANOTHER CHOICE.
 PAINTING,    WHEN NECESSARY, IS
AUTOMATIC."
62 PRINT:PRINT"     HIT ANY KEY T
O CONTINUE"
64 IFINKEY$=""THEN64
100 PCLS1:CLS0:PRINT@42,"SHAPE O
F FACE";:GOSUB500
101 PRINT@105,"(1) ROUND  FACE";
:F1$="BR36U20D32GD3GD2GD2G2DG3DG
3DG6LG3LGL2GLGL23HLHL2HLH3LH6UH3
UH3UH2U2HU2HU3HU32"
102 PRINT@137,"(2) LONG   FACE";
:F2$="BR36U20D28GD4GD3G2D2G2DG4D
G3DG8LG6LG2LGL11HLH2LH6LH8UH3UH4
UH2U2H2U3HU4HU28"
103 PRINT@169,"(3) OVAL   FACE";
:F3$="BR36U20D20GD4GD4GD3G2D2G3D
G2D3G3DG5DG6LG4LG2L12H2LH4LH6UH5
UH3U3H2UH3U2H2U3HU4HU4HU20"
104 PRINT@201,"(4) SQUARE FACE";
:F4$="BR36U20D32GD4GD3GD2G3DG8DG
3D2G4LG2LGL25HLH2LH4U2H3UH8UH3U2
HU3HU4HU32"
105 PRINT@233,"(5) HEART  FACE";
:F5$="BR36U20D20GD2G2D3G2D2GD2G4
DG6DG3DG2D2G4DG4L3GL8HL3H4UH4U2H
2UH3UH6UH4U2HU2H2U3H2U2HU20"
106 X=128:Y=96:S=6:I$=INKEY$:IFI
$=""THEN106
107 IFI$="1"THENZ$=F1$:GOTO113
108 IFI$="2"THENZ$=F2$:GOTO113
109 IFI$="3"THENZ$=F3$:GOTO113
110 IFI$="4"THENZ$=F4$:GOTO113
111 IFI$="5"THENZ$=F5$:GOTO113
112 GOTO106
113 GOSUB600
114 IFJ$="R"THENGOSUB611:GOTO100
115 IFJ$="C"THEN120
116 GOTO113
120 CLS4:PRINT@43,"HAIR STYLE";:
GOSUB500
121 PRINT@103,"(1) CURLY    HAIR
 ";:H1$="BU10E3R6F3ER4F4D4E3R6F4
D3F5D5GDG2F2D7G2D5G4U11H5U4L4H4U
4GL3GL9H2G6L8G3LGH2U8G6L2D7G4L2G
3D8H4U12H2U6E5HU4E4R4ER6U2E4R6FE
2R5F3"
122 PRINT@135,"(2) WAVY     HAIR
 ";:H2$="BU12R2F2R10E2F4DFD2R6F8
D4F4GDG3D5GD8H4U7EH2LH4L4U5E3L4G
L4G2L4G2L4G2L14H6E8L3G8L2D2G7D10
G6U4HU4H2U2H2U10E8R2E6R2E4R2E2R1
2F4"
123 PRINT@167,"(3) STRAIGHT HAIR
 ";:H3$="BU9R10FR6FR4FR2F2RF2RF7
D6GD3GD15L3U12H2L2H8U3H3G2L2GL3G
L6G2L6GL9GL9E7L3G4DG8LG3D12L3U13
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HU4HU8E8RE3R4E2R5E2R8R2F4"
124 PRINT@199,"(4) FRINGED HAIR
 ";:H4$="BU12R10FR4F2R3F4R4F2RF6
D2FD10GD4GD13L3U13H2U3H2UH2U2H3U
H4G7LG3L4GL4G2L7E12U2G8LG4L3G4L4
E6UE3UE3L2G10L2G2U2E2EU6G2D2G8DG
2D4G2D8L3U14HU2HU10E6RE6RE4R3ER2
E2R12F2RU"
125 PRINT@231,"(5) GOING BALD
 ";:H5$="BU8R8FR2FRF2RF3RF5R6F2R
2F3D2F2D10GD3GD10L3U12H8U2HUHU8H
BL48GD8GDGD2G8D12L3U10HU3HU10E2U
2E3R2E2R6E5RE3RE2RER2ER9"
126 X=130:Y=34:S=6:I$=INKEY$:IFI
$=""THEN126
127 IFI$="1"THENZ$=H1$:GOTO133
128 IFI$="2"THENZ$=H2$:GOTO133
129 IFI$="3"THENZ$=H3$:GOTO133
130 IFI$="4"THENZ$=H4$:GOTO133
131 IFI$="5"THENZ$=H5$:GOTO133
132 GOTO126
133 GOSUB600
134 IFJ$="R"THENGOSUB611:GOTO120
135 IFJ$="C"THEN138
136 GOTO133
138 PAINT(88,50),0,0:PAINT(172,5
0),0,0:FORK=1TO500:NEXTK:GOTO140
140 CLS3:PRINT@43,"TYPE OF EAR";
:GOSUB500
141 PRINT@104,"(1) WITH LOBES
";:E1$="BR27U8E4RFD4GHU4HLDGD2F3
E2D2GD2D3GD2GLHUHU3ERF2EBL4UE2BL
4UE2UH3BL51BD3H4LGD4FEU4ERDFD2G3
H2D2FD2D3FD2FREUEU3HLG2HBR4UH2BR
4UH2UE3"
142 PRINT@136,"(2) WITHOUT LOBES
";:E2$="BR27U6E4RFD4GHU4HLDGD2F3
E2D2GD2G4LU3ERFBH3BD3E2H2BL53BD3
U6H4LGD4FEU4ERDFD2G3H2D2FD2F4RU3
HLG"
143 PRINT@168,"(3) WIDE EARS
";:E3$="BR27U10E3R2F2DFD5GD2GBHU
4HUHU2H2LGE2R2F3DBD8D4G2DG2DGL2H
3F2BE6U3HGLG2UE2UE2H4LBL50BD8U10
H3L3G2DGD5FD2FBEU4EUEU2E2RFH2L2G
3DBD8D4F2DF2DFR2E3G2BH6U3EFRF2UH
2UH2E4R"
144 PRINT@200,"(4) FLAT EARS
";:E4$="BR27U10EUE2RF2D4BL5EUEUF
2BRD7GD3GD3G2H4F2BU10R2ED2REU6BG
6F3RD2BL56U10HUH2LG2D4BR5HUHUG2B
LD7FD3FD3F2E4G2BU10L2HD2LHU6BF6G
3LD2"
145 PRINT@232,"(5) POINTED EARS
";:E5$="BR28U10EU2EUEFDFD8GU7HUG
D2GD8EU2EFD8G2D2D2GH2U3H2F2BE3UH
UHGBL54U10HU2HUHGDGD8FU7EUFD2FD8
HU2HGD8F2D2D2FE2U3E2G2BH3UEUEF"
```




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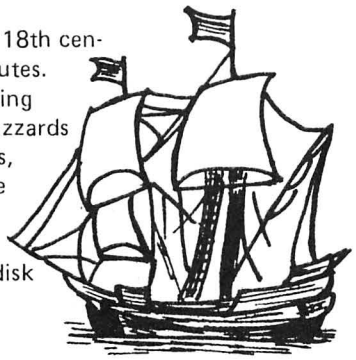


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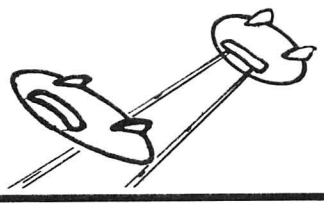
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New Sort program is faster and more efficient than original version. Runs in 16 or 32K to produce an alphabetic listing of all file types you specify.

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New Recover program not only rewrites directories from master files but can rebuild an entire disk to eliminate "I0" errors.

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New addition. User friendly directory Zapper to manually correct directory data when all else fails. Menu-driven with help files for novices.

```
146 X=128:Y=94:S=8:I$=INKEY$:IFI
$=""THEN146
147 IFI$="1"THENZ$=E1$:GOTO153
148 IFI$="2"THENZ$=E2$:GOTO153
149 IFI$="3"THENZ$=E3$:GOTO153
150 IFI$="4"THENZ$=E4$:GOTO153
151 IFI$="5"THENZ$=E5$:GOTO153
152 GOTO146
153 GOSUB600
154 IFJ$="R"THENGOSUB611:GOTO140
155 IFJ$="C"THEN160
156 GOTO153
160 CLS2:PRINT@44,"EYEBROWS";:GO
SUB500
161 PRINT@104,"(1) AVERAGE BROWS
";:W1$="BR6E3R11F3LH3L9GR9FL10UB
L14BD2H3L11G3RE3R9FL9GR10U
162 PRINT@136,"(2) BUSHY   BROWS
";:W2$="BR6E4R12F4LH4L12GR12FL13
GR14FL15GR16FL17BL12H4L12G4RE4R1
2FL12GR13FL14GR15FL16GR17"
163 PRINT@168,"(3) FINE    BROWS
";:W3$="BR6E2R13F2LH2L12GR13L13B
L12BDH2L13G2RE2R12FL13R13"
164 PRINT@200,"(4) SPARSE  BROWS
";:W4$="BR6E2R13F2BL27H2L13G2"
165 PRINT@232,"(5) SATANIC BROWS
";:W5$="BF3E7R16EG2L16GR15GL14GR
14GL14GR14GL14BL9BD2H7L16HF2R16F
L15FR14FL14FR14FL14FR14
166 X=128:Y=72:S=7:I$=INKEY$:IFI
$=""THEN166
167 IFI$="1"THENZ$=W1$:GOTO173
168 IFI$="2"THENZ$=W2$:GOTO173
169 IFI$="3"THENZ$=W3$:GOTO173
170 IFI$="4"THENZ$=W4$:GOTO173
171 IFI$="5"THENZ$=W5$:GOTO173
172 GOTO166
173 GOSUB600
174 IFJ$="R"THENGOSUB611:GOTO160
175 IFJ$="C"THEN180
176 GOTO173
180 CLS:PRINT@43,"EYE SHAPE";:GO
SUB500
181 PRINT@103,"(1) AVERAGE EYES"
;:Y1$="BR7E2RER6FR2F2LG2LGL5HLH2
ERER6FR2BD4BLGL7H2BE3BRD2FR2EU2H
D2LU2LD2LU2BL19BDH2LHL6GL2G2RF2R
FR5ERE2HLHL6GL2BD4BRFR7E2BH3BLD2
GL2HU2ED2RU2RD2RU2
182 PRINT@135,"(2) NARROW  EYES"
;:Y2$="BR7BD2E2R6F2RLG2LGL5HLH2E
R2ER6FR2BD4BLGL7H2BE5R2D4GL3U4R3
D3L2U2BL18H2L6G2LRF2RFR5ERE2HL2H
L6GL2BD4BRFR7E2BH5L2D4FR3U4L3D3R
2U2"
183 PRINT@167,"(3) WIDE    EYES"
;:Y3$="BR10E2RER3FRF3LG2L6H2RE2R
4FRBLL3D3R2U3L2D2RU2BL25H2LEL3GL
G3RF2R6E2LH2L4GLBRR3D3L2U3R2D2LU
2"
184 PRINT@199,"(4) ROUND   EYES"
;:Y4$="BR9E2RER3FR2F3LG2LGL5H3RE
2R4FRBLL3D4R3U4L3D3R2U2BL23BUH2L
HL3GL2G3RF2RFR5E3LH2L4GLBRR3D4L3
U4R3D3L2U2"
185 PRINT@231,"(5) CHINESE EYES"
;:Y5$="BR8E3R3F2RF5H2L8H2E2R3F3B
L2U3L3D3R2U2L2DBL20H3L3G2LG5E2R8
E2H2L3G3BR2U3R3D3L2U2R2D"
186 X=128:Y=81:S=7:I$=INKEY$:IFI
$=""THEN186
187 IFI$="1"THENZ$=Y1$:GOTO193
188 IFI$="2"THENZ$=Y2$:GOTO193
189 IFI$="3"THENZ$=Y3$:GOTO193
190 IFI$="4"THENZ$=Y4$:GOTO193
191 IFI$="5"THENZ$=Y5$:GOTO193
192 GOTO186
193 GOSUB600
194 IFJ$="R"THENGOSUB611:GOTO180
195 IFJ$="C"THEN200
196 GOTO193
200 CLS5:PRINT@43,"NOSE SHAPE";:
GOSUB500
201 PRINT@103,"(1) AVERAGE   NOS
E";:N1$="D15R2E2REUHBG5L2H2LHUEB
E6BF2UHU2BL4D2GD"
202 PRINT@135,"(2) STUBBY    NOS
E";:N2$="D13R2ER2E2ULBL12LDF2R2F
```


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```
R2U10BR4H2U3BL4D3G2"
203 PRINT@167,"(3) AQUILINE  NOS
E";:N3$="D15E2UE2RE2UH2BL10G2DF2
RF2DF2U13BR3HU3BL4D3G"
204 PRINT@199,"(4) BULBOUS  NOS
E";:N4$="D13BD4R3EUR2EU2H2BL10G2
D2FR2DFR3BU12BR2U3HUBL2DGD3"
205 PRINT@231,"(5) NARROW  NOS
E";:N5$="D16RE2REHBL8GFRF2BU10BR
3U2HU2BL2D2GD2"
206 X=129:Y=84:S=8:I$=INKEY$:IFI
$=""THEN206
207 IFI$="1"THENZ$=N1$:GOTO213
208 IFI$="2"THENZ$=N2$:GOTO213
209 IFI$="3"THENZ$=N3$:GOTO213
210 IFI$="4"THENZ$=N4$:GOTO213
211 IFI$="5"THENZ$=N5$:GOTO213
212 GOTO206
213 GOSUB600
214 IFJ$="R"THENGOSUB611:GOTO200
215 IFJ$="C"THENGOTO220
216 GOTO213
220 CLS6:PRINT@41,"SHAPE OF MOUT
H";:GOSUB500
221 PRINT@103,"(1) AVERAGE  MOUT
H";:M1$="RER2FR2FR2FR3L8L5HL2GL3
L3HL2GL5HLR3ER2ER2ER2FRBD3R5ER4G
2L3GL8HL3H2R4FR5"
222 PRINT@135,"(2) PURSED  MOUT
H";:M2$="RER2FR2F2RFRL5HL8GL5RER
E2R2ER2FRBD4R5ER3G2L2GL8HL2H2R3F
R5"
223 PRINT@167,"(3) WIDE  MOUT
H";:M3$="R4FR4FR3FR2FR6L3GL6HL20
GL6HL3R6ER2ER3ER4ER4BD5R5ER3ER20
2L2G2L12H2L2H2R2FR3FR7"
224 PRINT@199,"(4) NARROW  MOUT
H";:M4$="R3FR3FR3FR2L24R2ER3ER3E
R3BD4R5ER2EBL16FR2FR5"
225 PRINT@231,"(5) NEGROID  MOUT
H";:M5$="BU2R2ER4FR3FR3F2RF2L5HL
4HL2GL10HL2GL4GL5E2RE2R3ER3ER4FR
2BD7R5ER6ER5G3L2GL2GL3GL12HL3HL2
HL2H3R5FR6FR5"
226 X=128:Y=126:S=6:I$=INKEY$:IF
I$=""THEN226
227 IFI$="1"THENZ$=M1$:GOTO233
228 IFI$="2"THENZ$=M2$:GOTO233
229 IFI$="3"THENZ$=M3$:GOTO233
230 IFI$="4"THENZ$=M4$:GOTO233
231 IFI$="5"THENZ$=M5$:S=5:GOTO2
33
232 GOTO226
233 GOSUB600
234 IFJ$="R"THENGOSUB611:GOTO220
235 IFJ$="C"THEN240
236 GOTO233
240 CLS7:PRINT@43,"LONGER HAIR";
:GOSUB500
241 PRINT@105,"(1) CHIGNON (BUN)
";:A1$="R4FR5FR3F4D6GL34HU6E4R3E
R5ER4"
242 PRINT@137,"(2) BOBBED  HAIR
";:A2$="BU2R7F3R5F4R3F3R3F3D4F3D
6F5D4F4D20F3D3F5L3G3L20H3L3H2U4F
D3F2BL40E2U3ED4G2L3G3L20H3L3E5U3
E3U20E4U4E5U6E3U4E3R3E3R3E4R5E3R
7"
243 PRINT@169,"(3) AFRO  STYLE
";:A3$="BU2R7FR9F3R6F6R4F7R3F4D5
F3D5F3D10G3D3G4D4G4L3G4L6H3L3H6B
L40G6L3G3L6H4L3H4U4H4U3H3U10E3U5
E3U5E4R3E7R4E6R6E3R9ER7"
244 PRINT@201,"(4) WAVY  STYLE
";:A4$="BU2R5F2R6F3R4F3D3F4R2F2D
4F3D4F3D6F4D3F3G4D2G4L4G3L9BL40L
9H3L4H4U2H4E3U3E4U6E3U4E3U4E2R2E
4U3E3R4E3R6E2R6"
245 PRINT@233,"(5) PIGTAILS
";:A5$="BU2R9FR5F10R3F4D4F6D7F4D
4F4D4F4D4F4D4F4R2G7U2H4U4H4U4H4U
4H4D3G10L4BL45L3H10U3G4D4G4D4G4D
4G4D2H7R2E4U4E4U4E4U4E4U4E4U7E6U
4E4R3E10R5ER10"
246 X=128:Y=5:S=8:I$=INKEY$:IFI$
=""THEN246ELSEIFI$="C"THEN260
247 IFI$="1"THENZ$=A1$:GOTO253
248 IFI$="2"THENZ$=A2$:GOTO253
249 IFI$="3"THENZ$=A3$:GOTO253
```


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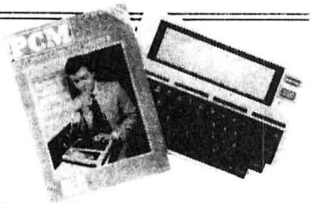
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```
250 IFI$="4"THENZ$=A4$:GOTO253
251 IFI$="5"THENZ$=A5$:GOTO253
252 GOTO246
253 GOSUB600
254 IFJ$="R"THENGOSUB611:GOTO240
255 IFJ$="C"THENPAINT(128,7),0,0
:FORT=1TO1000:NEXT:GOTO260
256 GOTO253
260 CLS8:PRINT@44,"SPECTACLES";:
GOSUB500
261 PRINT@103,"(1) OVAL        FRA
MES";:S1$="R2FR2E3RER8F2R2ER2ED2
GL2GL2U2D2D3G3LGL4HL2HLHU3L3HL2G
L3D3GLGL2GL4HLH3U5D2L2HL2HU2FR2F
R2E2R8FRF3R2ER2"
262 PRINT@135,"(2) SQUARE     FRA
MES";:S2$="R4UE2R13F2R2ER2ED2GL2
GL2U2D6G2L12H3U5L8UHL13G2L2HL2HD
2FR2FR2U2D6F2R12E3U5DR4"
263 PRINT@167,"(3) ROUND      FRA
MES";:S3$="R5ERE2RER2ER4FR2FRF2R
ER2ED2GL2GLU2D5GD2G2DG3LGL6HL2H3
U2HU7D3L8U3D7GD2G3L2GL6HLH3UH2U2
HU5D2LHL2HU2FR2FRE2RER2ER4FR2FRF
2RFR4"
264 PRINT@199,"(4) OCTAGONAL FRA
MES";:S4$="R5E4R8F4R2ER2E2RD2LG2
L2GL2U2D6G4L8H4U6D2L10U2D6G4L8H4
U6D2L2HL2H2LU2RF2R2FR2E4R8F4R5"
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265 PRINT@231,"(5) HALF  SPECTAC
LES";:S5$="R4FR14ER2ER2ER2D2L2GL
2GL2GLU2D4G3L8H3U5D2L8U2D5G3L8H3
U4D2LHL2HL2HL2U2R2FR2FR2FR14ER4"
266 X=128:Y=79:S=8:I$=INKEY$:IFI
$=""THEN266ELSEIFI$="C"THEN280
267 IFI$="1"THENZ$=S1$:GOTO273
268 IFI$="2"THENZ$=S2$:GOTO273
269 IFI$="3"THENZ$=S3$:GOTO273
270 IFI$="4"THENZ$=S4$:GOTO273
271 IFI$="5"THENZ$=S5$:GOTO273
272 GOTO266
273 GOSUB600
274 IFJ$="R"THENGOSUB611:GOTO260
275 IFJ$="C"THEN280
276 GOTO273
280 CLS0:PRINT@43,"BEARD STYLE";
:GOSUB500
281 PRINT@105,"(1) FULL       SET"
;:B1$="BR25BU20U6D6G12D2G2L4HL12
GL4H2U2H12U6L2D23F3D3F2D2F11R3F2
R5R7E2R3E11U2E2U3E3U23L2"
282 PRINT@137,"(2) FRANZ JOSEPH"
;:B2$="BR25BU20U6D6G12D2G2L4HL12
GL4H2U2H12U6L2D23F3D5F2R2E6R5ER4
ER6FR4FR5F6R2E2U5E3U23L2"
283 PRINT@169,"(3) GOATEE BEARD"
;:B3$="BR25BU20U6D6GD6GD8GD4G10L
5H2L10G2L5H10U4HU8HU6HU6L2D20F2D
7F25E25U7E2U20L2"
284 PRINT@201,"(4) SIDEBURNS    "
;:B4$="BR25BU20U6D6GD6GD4GD4R2F3
RU26L3BL50BD6U6D6FD6FD4FD4L2G3LU
26R3"
285 PRINT@233,"(5) BUSHY  BEARD"
;:B5$="BR25BU20U6D6G12D2G2L4H2L1
0G2L4H2U2H12U6L2D23FD12F3D2F3D3F
3R3F3R3F2R12E2R3E3R3E3U3E3U2E3U1
2EU23L2":PRINT@288,"MOVE THE BEA
RD 3 SPACES TO LEFT AND 3 SPACES
 TO RIGHT BEFORE    YOU PRESS <C
> FOR NEXT FEATURE."
286 X=128:Y=126:S=8:I$=INKEY$:IF
I$=""THEN286ELSEIFI$="C"THEN300
287 IFI$="1"THENZ$=B1$:GOTO293
288 IFI$="2"THENZ$=B2$:GOTO293
289 IFI$="3"THENZ$=B3$:GOTO293
290 IFI$="4"THENZ$=B4$:GOTO293
291 IFI$="5"THENZ$=B5$:GOTO293
292 GOTO286
293 GOSUB600
294 IFJ$="R"THENGOSUB611:GOTO280
295 IFJ$="C"THENPAINT(175,110),0
,0:PAINT(75,110),0,0:FORT=1TO200
0:NEXT:GOTO300
296 GOTO293
300 CLS2:PRINT@43,"MOUSTACHES";:
GOSUB500
301 PRINT@103,"(1) SPARSE GROWTH
```

```
";:U1$="BD1R4FR4FR2D2L4HL14GL4U2
R2ER4ER4"
302 PRINT@135,"(2) BUSHY  GROWTH
";:U2$="R6FR8FD2G2L5HL3HL8GL3GL5
H2U2ER8ER6"
303 PRINT@167,"(3) FRENCH  STYLE
";:U3$="R6FR4ER3ER3E2D2GDG2L2G2L
8HL10GL8H2L2H2UHU2F2R3FR3FR4ER6"
304 PRINT@199,"(4) ADOLF  HITLER
";:U4$="R4FR2D5L2HL6GL2U5R2ER4"
305 PRINT@231,"(5) DROOPY  STYLE
";:U5$="R4FR3FR3F4RF2D5LH2U2H2L3
HL4HL10GL4GL3G2D2G2LU5E2RE4R3ER3
ER4"
306 X=128:Y=114:S=8:I$=INKEY$:IF
I$=""THEN306ELSEIFI$="C"THEN320
307 IFI$="1"THENZ$=U1$:GOTO313
308 IFI$="2"THENZ$=U2$:GOTO313
309 IFI$="3"THENZ$=U3$:GOTO313
310 IFI$="4"THENZ$=U4$:GOTO313
311 IFI$="5"THENZ$=U5$:GOTO313
312 GOTO306
313 GOSUB600
314 IFJ$="R"THENGOSUB611:GOTO300
315 IFJ$="C"THENPAINT(128,121),0
,0:FORT=1TO1000:NEXTT:GOTO320
316 GOTO313
320 CLS3:PRINT@42,"LINES/WRINKLE
S";:GOSUB500
321 PRINT@105,"(1) CHEEK DIMPLE"
;:L1$="BD4BR18GD3FBL34EU3H"
322 PRINT@137,"(2) ON     CHEEKS"
;:L2$="BR10BD5F4RFRF3D4BU12H2L2H
2L2H2BL19G2L2G2L2G2BD12U4E3RERE4
"
323 PRINT@169,"(3) ON  FOREHEAD"
;:L3$="BU20R7ER2BD3L6GL7HL6BU3R2
FR7"
324 PRINT@201,"(4) DIMPLED CHIN"
;:L4$="BD36D5BU7ER5F3D2BL17U2E3R
5F
325 PRINT@256," YOU MUST BE CARE
FUL WITH YOUR   INSERTIONS HERE.
 LINES ARE NOW  SUPERIMPOSED AND
 NO ERASURES    OCCUR WHEN <r> I
S PRESSED."
326 X=128:Y=96:S=8:I$=INKEY$:IFI
$=""THEN326ELSEIFI$="C"THEN340
327 IFI$="1"THENZ$=L1$:GOTO333
328 IFI$="2"THENZ$=L2$:GOTO333
329 IFI$="3"THENZ$=L3$:GOTO333
330 IFI$="4"THENZ$=L4$:S=6:GOTO3
33
331 GOTO326
333 GOSUB600
334 IFJ$="R"THEN320
335 IFJ$="C"THEN340
336 GOTO333
340 CLS:PRINT" PRESS <P> TO PRIN
T AND/OR <C>   TO START AFRESH O
N A NEW FACE":FORI=1TO3:PLAY"O1L
15GL10AL15BO2L6CCCCL10CL15EL10DL
6C":NEXTI:PLAY"P10O2L10EL6GGFO1A
G"
341 I$=INKEY$:IFI$=""THEN341ELSE
IFI$="C"THENRUN
342 SCREEN1,0:PRINT#-2,CHR$(18):
FORY=0TO191STEP7:FORX=0TO255:V=P
POINT(X,Y)+(PPOINT(X,Y+1)*2)+(PP
OINT(X,Y+2)*4)+(PPOINT(X,Y+3)*8)
+(PPOINT(X,Y+4)*16)+(PPOINT(X,Y+
5)*32)+(PPOINT(X,Y+6)*64)
343 V=NOTV:IFV<0THENV=256+V
344 PRINT#-2,CHR$(V);:NEXTX:PRIN
T#-2,CHR$(13);:NEXTY:PRINT#-2,CH
R$(30)
345 CLS:LINEINPUT" enter THE NAM
E OF THE PERSON    YOU HAVE DRAW
N. THEN PRESS <C>  TO DRAW A NEW
 FACE.  ";FC$
346 PRINT#-2,"                 "+F
C$
347 IFINKEY$="C"THENRUNELSE347
500 PRINT@420,"PRESS YOUR CHOICE
 NUMBER";:RETURN
600 PMODE4,1:SCREEN1,1
601 GOSUB610
602 J$=INKEY$:IFJ$=""THEN602
603 IFJ$=CHR$(94)THENGOSUB611:Y=
Y-1
604 IFJ$=CHR$(10)THENGOSUB611:Y=
Y+1
605 IFJ$=CHR$(9)THENGOSUB611:X=X
+1
606 IFJ$=CHR$(8)THENGOSUB611:X=X
-1
607 IFJ$="E"THENGOSUB611:S=S+1:I
FS>9THENS=9
608 IFJ$="S"THENGOSUB611:S=S-1:I
FS<4THENS=4
609 RETURN
610 DRAW"BM"+STR$(X)+","+STR$(Y)
+"C0S"+STR$(S)+"XZ$;":RETURN
611 DRAW"BM"+STR$(X)+","+STR$(Y)
+"C1S"+STR$(S)+"XZ$;":RETURN
```

Hint . . .

What's Your ROM Number?

With all the talk about new ROMs, you may be wondering exactly which ROM you have. If you have Extended BASIC, just read the information at the top of the screen on power up. Then, to see which Color BASIC ROM you have, type *EXEC* 41175 and <ENTER>.

If you have the new ROMs, the Extended BASIC will indicate Version 1.1 and Color BASIC will be Version 1.2

RAINBOW

Give us your best: Join the ranks of these courageous CoCoists in showing the Color Computer world your high score at your favorite micro-diversion. We want to put your best effort on record in *the Rainbow's* Scoreboard column. All entries must be received by the first of the month to be eligible for the following month's Scoreboard. Each individual is limited to three score entries per month.

★ **New Number One** • **Last Month's Number One**

ALCATRAZ II *(Spectral Associates)*
18,790★ Chris Sweet, Harvard, MA
8,710• Kanti Dinda, Kingston, Ontario

ANDROID ATTACK
25,000★ Wes Hill, Vashon, WA
15,500 Cameron Amick, Reisterstown, MD

ASSAULT *(Computer Shack)*
1,100★ Kevin Mesecher, Ft. Walton Beach, FL

ASTRO BLAST *(Mark Data)*
158,000★ Larry Plaxton, Medley, Alberta
157,000 Scott Drake, Pine City, NY
104,464 Jim Baker, Florissant, MO
98,000 Tim Warr, Bellingham, WA
92,000 Harry Sawyer, Watchung, NJ

ASTEROID
2,322★ Matt McMann, New Boston, MI

AVENGER *(The Cornsoft Group)*
24,575★ Rich McGervey, Morgantown, WV
19,480• Jim Sparke
19,220 Vince Lok, Mississauga, Ontario
16,310 Dave Lubnow, Sussex, NJ
14,075 Stephen Lai, Palatine, IL

BIRD ATTACK *(Tom Mix)*
200,725★ Peter Niessen, Carlisle, MA
110,850 Chris Sweet, Harvard, MA

BLEEP
105★ Matt McMann, New Boston, MI

BLOC HEAD *(Computerware)*
286,900★ Ron Moore, Greensburg, PA
104,575 Rich McGervey, Morgantown, WV
47,775 Chris Long, Manitouwadge, Ontario
47,375 Van Adams, Poplarville, MS
42,225 Hal Mermelstein, S. Windham, MA
40,250• Ed Bottini, St. Louis, MO
29,475 Derek Keener, Columbus, OH

BUSTOUT *(Radio Shack)*
42,000★ Derrick Kardos, Colonia, NJ
34,700 Sara Hennessey, Golden Valley, MN
28,720 Perry Denton, New Baden, IL
27,880 Mike Wells, Pittsburgh, PA
17,170 Neil Berkman, DeWitt, NJ
11,060 Ryan Van Manen, Grand Rapids, MI
7,314 John Mattox, Atlanta, GA
6,570 Rich Van Manen, Grand Rapids, MI

CANYON CLIMBER *(Radio Shack)*
155,900★ Dustin Yates, Shreveport, LA
133,400 Kevin Dawdy, Findlay, IL
127,800 Michael Garvie, Pekin, IL
121,800 William Daley, Biloxi, MS
118,000 Kevin Boehm, Springfield, IL
117,200 Ryan Van Manen, Grand Rapids, MI
114,400• Rich Van Manen, Grand Rapids, MI
113,800 Kevin Dawdy, Findlay, OH
112,000 Nicolle Zeman
98,600 Jimi Barr, Long Beach, CA
82,700 Andrew Herron, High Point, NC
81,400 Richard Rankin, Kitchener, Ontario
74,600 Sal Barlett, Mesa, AZ
61,000 Dale Mihocko, Phoenix, AZ
57,500 Don Cornett
55,400 John Mattox, Chattanooga, TN
51,000 Barry Cole, Long Beach, CA
49,800 Michael Piantoni, Brockton, MA
45,200 John Bennett, St. Albans, WV
44,600 Chris Long, Manitouwadge, Ontario
34,000 Jay Johnson, Puyallup, WA
28,400 Robert Daley, Biloxi, MS

CATCH 'EM *(Aardvark)*
237,000★ Craig Edelheit, W. Bloomfield, MI
91,000 Dean Bouchard, Kingston, N.S.
70,157 Kirk Beler, Taber, Alberta
65,768 Laura Sandman, Louisville, KY

CATERPILLAR *(Aardvark)*
63,100★ Todd Byington, N. Salt Lake, UT
54,608 Lawrence McElligott, Lancaster, CA
53,233 Ron Pinson, Guelph, Ontario
45,813 Wes Hill, Vashon, WA
31,742 Daniel Milbrath, Ann Arbor, MI

CAVE HUNTER *(Mark Data)*
42,600★ Gary Ritchie, Bellevue, Alberta
27,050 Jim Baker, Florissant, MO
26,300 Mike Hughey, King George, VA
21,150 Jim Baker, Florissant, MO
15,200 Rich McGervey, Morgantown, WV

CLOWNS & BALLOONS *(Radio Shack)*
83,710★ Don Fraser, Shakope, MN
77,910 Dan James, Clearwater, FL
74,920 Sal Barlett, Mesa, AZ
74,600 Jimmy Kendall, Elkview, WV
72,840• Lyman Green, Jr., Dayville, CT
72,290 Lloyd Stagg, Pensacola, FL
64,980 Andrew Figel, Sardes, OH

COLOR COSMIC INVADERS
62,300★ Peter Niessen, Carlisle, MA

COLOR CUBES (Radio Shack)
4:50★ John Handis

COLOR HAYWIRE — formerly Berserk *(Mark Data)*
22,050★ Jim Baker, Florissant, MO
17,850 Brian Wallingford, Fall River, MA
14,850 Michael Rhattigan, Cary, NC
14,750 Rich McGervey, Morgantown, WV
12,450 Chris Coyle, Selden, NY
9,800 Dave Lubnow, Sussex, NJ
9,150 Cameron Amick, Reisterstown, MD
8,150 Greg Brink, Portage, MI

COLOR INVADERS *(Computerware)*
240,700★ Roland Hendel, Mississauga, Ontario
227,050 John Osborne, Kincardine, Ontario
217,635 Jim Baker, Florissant, MO
126,350 Perry Denton, New Baden, IL
93,510 Rich McGervey, Morgantown, WV

COLOR METEROIDS *(Spectral Associates)*
1,496,000★ Craig Edelheit, W. Bloomfield, MI
1,253,200 Jeff White, Prairie de Chien, WI
292,000 Roland Hendel, Mississauga, Ontario
292,000 Vince Lok, Mississauga, Ontario
252,050 Larry Plaxton, Medley, Ontario

COLORPEDE *(Intracolor)*
3,355,248★ Scott Drake, Pine City, NY
2,745,982• Roland Hendel, Mississauga, Ontario
2,547,299 Rich McGervey, Morgantown, WV
2,400,735 Scott Sehlhorst, Columbia, SC
2,139,248 Mike Hall, Hartland, WI
1,099,380 Greg Burke, Kenora, Ontario
572,930 Sal Barlett, Mesa, AZ
474,322 Richard Manley, San Bernadino, CA
458,601 Phil Wilkins, Vancouver, BC
382,000 Dave Lubnow, Sussex, NJ
306,028 Rick Ingram, Wheatland, WY
245,723 Cameron Amick, Reisterstown, MD
177,600 Kris Ponder, Jacksonville, FL

COLOR SCARFMAN *(The Cornsoft Group)*
976,520★ Bruce Thornhill, Barrhead, Alberta
772,000 Keith Seifried, Greenville, OH
600,410 Roland Hendel, Mississauga, Ontario
539,100 Larry Plaxton, Medley, Alberta
530,200 Alan Klotzback, Plainesville, OH

COLOR ZAP *(Spectral Associates)*
227,330★ Ron Rhead, Willowdale, Ontario
84,400 Chris Sweet, Harvard, MA
82,710 Neil Berkman, DeWitt, NY
50,800 Scott Sehlhorst, Columbia, SC

COLOUR PAC ATTACK *(Computerware)*
472,465★ Jim Baker, Florissant, MO
211,000 Roland Hendel, Mississauga, Ontario
193,000 Cameron Amick, Reisterstown, MD
189,540 Mark Nichols, Birsay, Saskatchewan
154,600 Greg Lesher, North Chili, NY
135,965 Kanti Dinda, Kingston, Ontario

CONQUEST OF KZIRGLA *(Rainbow Connection Software)*
50,199★ Bruce Uher, Coshocton, OH
10,399 Scott Sehlhorst, Columbia, SC

COSMIC CLONES *(Mark Data)*
41,300★ John Osborne, Kincardine, Ontario

CROSSWORDS *(Radio Shack)*
322★ Bob Strong, Chicago, IL

CUBER *(Tom Mix)*
74,465★ Mark Skala, Fairview, PA

DEATH TRAP *(Soft Sector)*
84,672★ Sandra Willard
75,431• Jeff Willard, Chireno, TX
41,490 M. A. Brickler, Allen Park, MI
41,272 Perry Willard, Chireno, TX
33,777 Dawayne McKinney, Chireno, TX

DEFENSE *(Spectral Associates)*
68,750★ M. A. Brickler, Allen Park, MI
58,900• Greg Scott, Orlando, FL

DEMON ASSAULT
49,000★ Steve Mooney, W. Bloomfield, MI

DOODLEBUG *(Computerware)*
1,577,320★ Bobby Bruce, Springfield, MO
1,265,580 Lawrence McElligott, Lancaster, CA
1,152,360 Marc Hassler
1,120,900 Greg Burke, Kenora, Ontario
1,063,110 Richard Rankin, Kitchener, Ontario

DOUBLEBACK *(Radio Shack)*
435,570★ Phillippe Morsan, St. Jerome, Quebec
429,000 Steve Damm, Phoenix, AZ
378,750 Jim Wolf, South Bend, IN
228,690 Paul Moritz, Butte, MT
195,640 Terry Steen, San Bernardino, CA
151,270 Joyce Nyman, Millinocket, ME
138,720 Ryan Van Manen, Grand Rapids, MI
126,450 Jamie Gritton, Irvine, CA
120,830 Jay Johnson, Puyallup, WA

DUNKEY MUNKEY *(Intellectronics)*
3,214,200★ Rich McGervey, Morgantown, WV
1,618,800• Bryan Bloodworth, Federal Way, WA
1,437,200 Mike Wells, Pittsburgh, PA
1,245,000 Jodi Knudsen, Kenosha, WI
1,924,000 Andrew Herron, High Point, NC

FAST LANE
23,782★ Philip Deen, Enterprise, FL
93 Marie Love, Columbia, SC

FIRECOPTER *(Adventure International)*
113,880★ Steve Skrzyniarz, Tacoma, WA
74,640 Cameron Amick, Reisterstown, MD

FLYBY
3,670★ Cameron Amick, Reisterstown, MD

THE FROG *(Tom Mix)*
47,360★ Jeannie Hawkins, Deltona, FL
36,260 Chris Coyle, Selden, NY
30,500 Frank Bottini, St. Louis, MO
26,666 Jason Sanchez, Orangevale, CA
22,400 Derrick Kardos, Colonia, NJ
15,500 M. A. Brickles, Allen Park, MI

FROGGER *(The Cornsoft Group)*
25,425★ Kanti Dinda, Kingston, Ontario
17,945• Steve Skrzyniarz, Tacoma, WA
17,825 Cameron Amick, Reisterstown, MD
8,600 Tim Warr, Bellingham, WA

FROG-MAN *(Computer Island)*
3,735★ Aaron T. Cincotta, Peru, IN

SCOREBOARD

FROG TREK *(Oelrich Publications)*
14,700★ Greg Burke, Kenora, Ontario
14,080 Alan Weiss, Summit, NJ
11,200 Jim Partridge, Clinton, CT
10,370 Jim Baker, Florissant, MO
8,550 Tom Eberhardt, Fairview Park, OH

GALACTIC ATTACK *(Radio Shack)*
67,750★ Chuck Gaudette, Monroe, CT
58,000 Terry Steen, San Bernadino, CA
55,360 Donald Thompson, Lubbock, TX
54,200 Mike Hughey, King George, VA
54,000 Craig Edelheit, W. Bloomfield, MI
49,850 Rich Van Manen, Grand Rapids, MI
26,240 Ryan Van Manen, Grand Rapids, MI
22,150 David Belsite, Valhalla, NY
10,770 Cameron Amick, Reisterstown, MD

GALAX ATTAX *(Spectral Associates)*
82,650★ Steve Hargis, Tucson, AZ
73,000 Wes Hill, Vashon, WA
66,750 Jim Wolf, South Bend, IN
60,950● Dennis Goehring, Mississauga, Ont.
53,350 Richard Rankin, Kitchener, Ontario

GERM
307★ Peter Niessen, Carlisle, MA

GERM WARFARE
258★ Cameron Amick, Reisterstown, MD

GHOST GOBBLER *(Spectral Associates)*
825,250★ Randy Gerber, Wilmette, IL
423,390 Rich McGervey, Morgantown, WV
255,000 John Osborne, Kincardine, Ontario
142,070 Chris Kulawy, St. Johnsville, NY
125,000 Bobby Bruce, Springfield, MO
119,110 Sal Barlett, Mesa, AZ
90,000 Wes Hill, Vashon, WA
74,590 Cameron Amick, Reisterstown, MD
64,230 Richard Manley, San Bernadino, CA
63,200 Tommy Pollock, Macon, GA
63,170 Eron Sudhausen, Half Moon Cay, CA
63,000 Greg Burke, Kenora, Ontario
49,990 Phil Wilkins, Vancouver, BC
17,990 Maureen Coffey, Blasdell, NY

GOLF *(Aardvark)*
40★ Matthew Brenengen, Lakelmo, MN

GRABBER *(Tom Mix)*
44,100★ Steve Skrzyniarz, Tacoma, WA
31,200 Cameron Amick, Reisterstown, MD
30,600 Phil Calandrino, Springfield, IL

GRANPRIX *(Computerware)*
5,875★ Steve Skrzyniarz, Tacoma, WA

INVADERS REVENGE *(Med Systems)*
451,060★ John Osborne, Kincardine, Ontario
32,600 Harry Sawyer, Watchung, NJ
16,300 Eric Lund, Millington, NJ

KATERPILLAR ATTACK *(Tom Mix)*
163,526★ Andy Truesdale, Ferguson, MO
109,247 Jamie Gritton, Irvine, CA
14,375 Norbert Berenyi, Northvale, NJ
14,211 Roland Hendel, Mississauga, Ontario
12,703 Warren Schubert, Newfoundland, NJ

KEYS OF THE WIZARD *(Spectral Associates)*
640★ Steve Skrzyniarz, Tacoma, WA

THE KING *(Tom Mix)*
4,040,300★ Andy Truesdale, Ferguson, MO
2,410,200 Candy Harden, Birmingham, AL
1,858,000 Mike Hughey, King George, VA
1,670,200 Joel Doucet, Yarmouth, Nova Scotia
1,549,200 Frank Bottini, St. Louis, MO
1,011,100 Don Fraser, Shakopee, MN
853,600 Chris Sweet, Harvard, MA
654,300 Chris Coyle, Selden, NY
600,600 Phil Calandrino, Springfield, IL
410,500 Sammy Tao, Corpus Christi, TX
356,800 Greg Burke, Kenora, Ontario
310,900 Rich McGervey, Morgantown, WV
227,000 Robert Lang, Port McNeill, BC
162,300 Michael Rhattigan, Cary, NC
148,500 Eric Jernslet, Courtenay, BC
142,100 Aaron Sonnenshine, Oroville, CA
123,150 Sal Barlett, Mesa, AZ
118,000 Jac Cichetti, Raleigh, NC
115,600 Cameron Amick, Reisterstown, MD
112,700 Matt Staller, Cliffside Park, NC

KLENDATHU
987,500★ Richard Minton, West Frankfort, IL

KOSMIC KAMIKAZE *(IMB)*
200,550★ Fred Iha, Columbus AFB, MS
49,900 Mark Raphael, Englishtown, NJ
10,700 Larry Mesecher, Ft. Walton Beach, FL
5,250 Kirk Mesecher, Ft. Walton Beach, FL
200 Kevin Mesecher, Ft. Walton Beach, FL

LANCER *(Spectral Associates)*
79,400★ Brent Murphy, Sweetser, IN
73,200 Jeff Jackson, Littleton, CO
67,350 Van Adams, Poplarville, MS
57,150 Steve Skrzyniarz, Tacoma, WA
56,400 Miles Langmacher, Minco, OK

MEGA-BUG *(Radio Shack)*
60,000★ Robin Worthem, Milwaukee, WI
16,632 John Tiffany, Washington, D.C.
15,999 Ed Mitchell, Ragged Mountain, CO
14,297 Aleisha Hemphill, Los Angeles, CA
13,852 Ryan Van Manen, Grand Rapids, MI
13,850 Jim Martin, Uniontown, OH
13,801 Rich Van Manen, Grand Rapids, MI
12,248 Steve Hemphill, Los Angeles, CA
9,243 Gary Urquhart, Mississauga, Ontario

MEGAPEDE *(Computerware)*
89,036★ Mark Skala, Fairview, PA
67,605● Ed Bottini, St. Louis, MO
58,070 Rich Van Manen, Grand Rapids, MI
55,291 Ryan Van Manen, Grand Rapids, MI
53,019 Jim Ganninger, Des Peres MO
17,018 Cameron Amick, Reisterstown, MD

METEOROIDS *(Spectral Associates)*
140,210★ Fred Iha, Columbus AFB, MS

METEORS
17,810★ Lenny Munitz, Bellerose, NY
13,120 Jennifer Klamp, Winter Park, FL

MICROBES *(Radio Shack)*
318,830★ Hwan Joo, Weston, Ontario
316,200 Steve Mayer & Keith Seifried, Greenville, OH
259,700 Sheila Coleman, Griffin, GA
258,150 Rich Van Manen, Grand Rapids, MI
244,700 Ian Waters, North Hero, VT
108,000 Robert Lang, Port McNeill, BC
98,180 Daryl Daniels, San Bernadino, CA

MOON HOPPER *(Computerware)*
809,750★ Ed Bottini, St. Louis, MO
142,800 Ron Rhead, Willowdale, Ontario
100,640 Cameron Amick, Reisterstown, MD

MONKEY KONG *(Med Systems Software)*
1,000,000★ Wes Hill, Vashon, WA
1,876 Kanti Dinda, Kingston, Ontario
1,323 Ryan Van Manen, Grand Rapids, MI
1,210 Susan Brink, Portage, MI
1,185 Mike Fath, Wadsworth, OH
1,109 Tom Rice, Flint, MI

MONSTER MAZE *(Radio Shack)*
520,470★ Robert L. Bull, Trenton, Ontario
323,490 Philip Morrissey, Gilboa, NY
200,000 Daniel Milbrath, Ann Arbor, MI
150,000 Jamie Gritton, Irvine, CA
114,000 Michael Daley, Biloxi, MS
62,400 Ruben Lipszyc, Sarnia, Ontario
11,470 Rich Van Manen, Grand Rapids, MI
9,100 David Vickberg, Minneapolis, MN

MOROCCO GRAN PRIX *(Computerware)*
4,153★ Frank Bottini, St. Louis, MO
2,344 Cameron Amick, Reisterstown, MD

MR. MUNCH
40,000★ Wes Hill, Vashon, WA
20,000 Scott Drake, Pine City, NY

NERBLE FORCE *(Computerware)*
315,150★ Frank Bottini, St. Louis, MO
49,200 Jim Ganninger, Des Peres, MO

NIBBLER *(Color Quest)*
20,650★ Rich McGervey, Morgantown, WV
14,910● Christal Glovinsky, Staten Island, NY

NINJA WARRIOR *(The Programmer's Guild)*
74,500★ Greg Burke, Kenora, Ontario
27,500● Jeff Teague, Noblesville, IN

OFFENDER *(American Business Computers)*
999,900★ Scott Drake, Pine City, NY
965,400● Jim Baker, Florissant, MO
406,800 Betty Moore, Greensburg, PA
293,900 Marla Moore, Greensburg, PA
273,900 Walt Moore, Greensburg, PA

PAC-ATTACK II *(Computerware)*
107,070★ Mark Skala, Fairview, PA
88,860 Michael J. Garozzo, Morrisville, PA
62,870● Stanley Sneed, Erwin, TN
44,000 Robert Lang, Port McNeill, BC
42,045 Dave Lubnow, Sussex, NJ
41,063 John Heins, Virginia Beach, VA

PAC-DROIDS *(The Programmer's Guild)*
1,476,730★ Joshua Josephson, Corning, NY
577,140● Richard Cochrane, Wayne, NJ
151,590 Annita Powell, Huber Heights, OH
140,300 John Yapp, Park Forest, IL
94,140 Lee Powell, Huber Heights, OH
80,600 Cornelius Washington, Jr., St. Louis, MO

PACET-MAN *(American Business Computers)*
26,800★ Vince Lok, Mississauga, Ontario
14,050 Susan Brink, Portage, MI
7,200 Fred Iha, Columbus AFB, MS
5,000 Cameron Amick, Reisterstown, MD
3,392 Norbert Berenyi, Northvale, NJ

PARACHUTE JUMP *(JARB Software)*
451,000★ John Osborne, Kincardine, Ontario

PHANTOM SLAYER *(Med Systems)*
1,306★ Marc Hassler
406 Imre Kertesz, Chandler, AZ
197 Mark Heizler, Ridgefield, CT
180 Mike Hall, Hartland, WI
84 Steve Skrzyniarz, Tacoma, WA

PICNIC *(Computer Island)*
100,000★ Scott Drake, Pine City, NY
1,220 Jon Bauch, South Fallsburgh, NY

PINBALL *(Radio Shack)*
4,000,000★ Keith Seifried, Greenville, OH
300,250 Brad Widdup, Dundas, Ontario
101,500 Chris Harland, Regina, Saskatchewan
138,950 Ryan Van Manen, Grand Rapids, MI
66,650 Ken Miller, Yardley, PA

PLANET INVASION *(Spectral Associates)*
483,250★ Chris Sweet, Harvard, MA
286,075● Larry Plaxton, Medley, Alberta
257,900 Ron Rhead, Willowdale, Ontario
221,350 John Cole, King City, Ontario
207,150 Mike Hughey, King George, VA

PLANET RAIDERS *(Aardvark)*
2,010,900★ Bill Messerick, S. St. Paul, MN

POLARIS *(Radio Shack)*
256,018★ Michael Popovich, Sr., Nashua, NH
218,450 Allen Roth, Dayton, TX *
212,746 Hwan Joo, Weston, Ontario
170,100 Steve Johnson, Santa Ana, CA
151,154 Brian Austin, Rotterdam, NY
130,828 Rich Van Manen, Grand Rapids, MI
129,996 Ryan Van Manen, Grand Rapids, MI
80,572 Wes Hill, Vashon, WA
59,200 Dave Lubnow, Sussex, NJ
6,913 Pat Mahoney, Orchard Park, NY

POLTERGEIST *(Radio Shack)*
6,455★ Rich Van Manen, Grand Rapids, MI
4,978● Tim Warr, Bellingham, WA
4,956 Mark Dowling, San Bruno, CA
4,835 Scott Butler, Springfield, IL
4,710 Don Turowski, Natrona Heights, PA
4,600 Robert Lang, Port McNeil, BC
3,920 Maureen Coffey, Blasdell, NY

continued

MORE... RAINBOW SCOREBOARD

POPCORN *(Radio Shack)*
560,900★ Vince Lok, Mississauga, Ontario
168,680 Steve Johnson, Santa Ana, CA
136,530 Scott Sehlhorst, Columbia, SC
110,570 Cameron Amick, Reistertown, MD
96,470 Mike Wells, Pittsburgh, PA
67,100 Richard Minton, West Frankfort, IL
49,650 Alan Klotzback, Plainesville, OH
35,340 Sal Barlett, Mesa, AZ
29,170 Maureen Coffey, Blasdell, NY
18,490 Pat Mahoney, Orchard Park, NY

PROTECTORS *(Tom Mix)*
594,610★ Roland Hendel, Mississauga, Ontario
358,514 Cameron Amick, Reisterstown, MD
275,810 Julian Bond, Berkeley, CA
272,000 Douglas Hug, Roseville, CA
217,000 Ian Waters, North Hero, VT
57,725 Matt Browning, Clearwater, FL
54,450 Keith Walter, Belvidere, IL

RAIL RUNNER *(Computerware)*
53,520★ Jim Baker, Florissant, MO
53,400 Ed Bottini, St. Louis, MO
19,400 Chris Sweet, Harvard, MA
15,520 Kirk Mesecher, Ft. Walton Beach, FL
12,275 Larry Mescher, Ft. Walton Beach, FL

ROBOTTACK *(Intracolor)*
1,512,200★ Robert Kiser, Monticello, MS
1,219,810● Steve Skrzyniarz, Tacoma, WA
1,197,800 Brian Austin, Rotterdam, Ny
1,146,750 Justin Marcus
1,107,400 John Osborne, Kincardine, Ontario
1,055,100 Ron Moore, Greensburg, PA
828,750 Marie Stumpf, McHenry, IL
757,900 Jim Wolf, South Bend, IN

ROBOT BATTLE *(Spectral Associates)*
21,000★ Bobby Bruce, Springfield, MO

SCARFMAN *(Cornsoft)*
371,540★ Stanley Sneed, Erwin, TN
121,600 M. A. Brickles, Allen Park, MI

SEA DRAGON *(Adventure International)*
60,430★ Steve Skrzyniarz, Tacoma, WA
36,540 Steve Schweitzer, Sewell, NJ
27,500 Wes Hill, Vashon, WA
23,750 Stephen Harden, Birmingham, AL
15,300 Derek Keener, Columbus, OH

SHAFT *(Prickly-Pear Software)*
18,150★ Loren Seng, Tuscon, AZ
17,160 Julian Bond, Berkely, CA

SHARK ATTACK
9,000★ Cameron Amick, Reisterstown, MD

SHARK TREASURE *(Computerware)*
72,000★ Marc Hassler
60,000 Aaron Peelle, Bennington, VA
50,000 Jennifer Klamp, Winter Park, FL
48,000 Ed Bottini, St. Louis, MO

SHOOTING GALLERY *(Radio Shack)*
37,300★ Mark Nichols, Birsay, Saskatchewan
37,200● Chris Kulawy, St. Johnsville, NY
37,080 Gary Long, Peru, NY
33,060 Mrs. Merle Burzynski, Erie, MI
31,230 D. A. Turowski, Natrona Heights, PA

SKIING *(Radio Shack)*
31.52★ Andy Truesdale, Ferguson, MO
40.10 Fred Herrmann, Flemington, NJ
49.43 John Scanlan, Prairie Village, KS
52.22 Peter Johnson, Chino, CA
53.57 Jay Stewart, Delhi, NY
1:13.13 Phil Calendrino, Springfield, IL

SKY DEFENSE *(Quasar Animations)*
9,700★ Vince Lok, Mississauga, Ontario
6,700 Mike Anheluk, Fall Creek, OR
6,120 Steve Skrzyniarz, Tacoma, WA
5,200 Cameron Amick, Reisterstown, MD

SNAIL'S REVENGE
510★ Matt Luck, McLean, VA
420 Christie James, Ashland, VA

SOLO POKER *(Radio Shack)*
640★ Mary J. Herring, Bloomington, IL

SOLO POOL *(Tom Mix)*
103★ John Fraysse, Dahlren, VA

SPACE ACE *(Spectral Associates)*
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Using The Upper RAM Of Your 64K

By Jorge Mir

The January 1983 issue of *the Rainbow* (page 166) contained one of my articles describing a program that would modify other BASIC programs so that they could run in the unused upper RAM portion of a 64K system. Since then, I have been receiving several phone calls or letters every week regarding questions about the program or suggestions for improvement (mainly speeding up the process) to make it more convenient to use the full 64K power of the Color Computer.

Since there has been so much interest in using the "wasted" RAM available in a 64K system, I decided to revise the program to make it simpler to use. You will note that, in order to accomplish my objectives, I ended up with two programs: *CONVERT*, which actually changes the BASIC program so that it runs in upper RAM; and *64KBASIC*, which loads and executes the converted programs. This way, you can convert BASIC programs and save them on tape or disk rather quickly. Then, later on, you just run the short "loader" program (*64KBASIC*) which will load the converted programs and run them automatically.

If you have a disk system, you can convert programs up to a length of no more than 9,980 bytes. With a cassette system, programs up to a length of 16,720 bytes can be converted and run in the upper RAM area. The *CONVERT* program determines what type of system you are running and sets up all parameters automatically.

Once the program is converted, you will be asked for a filename which must not exceed eight characters. If you have a disk system, the program will automatically add ".64K" as the extension before it is saved. Please note that the program will be saved as if it were a machine language program and cannot be *CLOADed* or *LOADed*. Hence, the need for a "loader" type program, *64KBASIC*.

The loader program switches the computer to 64K using a short machine language subroutine that loads the converted BASIC program, sets the proper BASIC pointers, and runs it. This is true whether you are running a disk or cassette system. When you run the loader program, it will prompt you for the program name and ask you if you are running a cassette or disk system. This last prompt could be determined automatically, but was added in case someone wants to load and run programs on cassette while using a disk system. It can be modified easily so that no prompting is required if you are bothered by it.

Many of the people who called because they were having difficulties were trying to run the program without reading and following the instructions and, of course, could not work the program properly. Therefore, I will repeat the instructions here. Follow them closely to avoid any problems:

1. Turn the computer off and then back on. This will assure you are in the *PCLEAR4* mode.
2. Load the program you want to convert so that it runs in the upper RAM area. Do not *RUN* the program.
3. Change the BASIC pointers by typing the following and pressing <ENTER>:
   POKE 25, PEEK(27) : POKE 26, PEEK(28) : NEW
4. Load and *RUN* the *CONVERT* program.
5. After the program is converted, you will be asked for a filename and asked to get ready for storing the program. After answering the prompts, it will save the converted program to cassette or disk, according to the system in use.

The above steps will complete the conversion procedure and the program will then be ready for use. As previously noted, you have to run the program using the loader program called *64KBASIC* which will prompt you for the program name to be *RUN*.

This procedure speeds up the whole process considerably since programs to be run are already converted and the loader program is rather short and quick.

For those of you who are beginning to program or simply like to find out how programs work, the rest of this article is devoted to an explanation of the programs.

First, let's discuss the *CONVERT* program.

Step 10 checks to see if you have a disk system. The simplest way is to check what the ASCII value is at &HC000.

If it is a 68, then you have the disk ROM in place, so the value of "S" is set at *H2601 (beginning of BASIC when in the *PCLEAR4* mode). If it is not a 68, then the value of "S" is set

(Jorge Mir, a Certified Public Accountant, is currently controller of a Fortune 500 Corporation. Personal computing is his main hobby and he publishes most of his original work through the Rainbow.)

at &H1E01, the beginning of BASIC when not using a disk system. The other variables ("SS" and "BS") are also set. This is where we trick the computer so that programs can run in upper RAM.

If you had a monitor and were able to look inside the computer's memory you would note that each BASIC step, as stored in memory, is preceded by a reference. This reference tells the computer where to look for the beginning of the next BASIC step, in essence, it points where to go after executing the current step. The *CONVERT* program changes these references so that the programs can run in the upper RAM area. It does so by adding an offset value to these references. These offset values are calculated as follows:

	Type of system in use	
	Disk	Cassette
Start of BASIC (PCLEAR4)	&H2601	&H1E01
Start of usable upper RAM in a 64K system	&HD801	HC001
Number of bytes in between	&HB200	&HA200

You can actually compute these values with your computer by typing in the following:

PRINT HEX$ (&HD801—&H2601), or
PRINT HEX$ (&HC001—&H1E01)

Thus, the values of "SS" and "BS" are set according to the system in use once the program determines whether or not you are using a disk system.

Step 20 simply sets the value of "E" to the end of the program you want converted. Since *CONVERT* follows directly after that program, then the value would be two bytes less than the beginning of *CONVERT*. The beginning of BASIC programs can be determined by *PEEKing* at locations 25 and 26 as is done in step 20 (without subtracting two bytes). Since we want to keep the value of "S" constant, we make another variable (which will be changed during execution of the program) by making "X" equal to "S."

Step 30 determines what the next step reference is making the variable A1 equal to the most significant byte and the value of A2 equal to the least significant byte. Then, the value of A is set to equal the reference in RAM (by multiplying A1 times 256 and adding A2 to it).

Step 40 changes the most significant reference to the next step by adding the offset (SS) as previously explained.

Step 50 checks to see if we have reached the end of the program. If it is not the end, it will go to step 60 where X becomes the next step reference and the whole process is repeated again by going to step 30. If it is the end of the program, then we go to step 70.

Step 70 simply sets the last two bytes of the program to zero, indicating the end of the program.

Step 80 sets three zeroes at the beginning of BASIC, according to whether you are running a disk or cassette system. You should note that the variable "BS" should be changed if your BASIC program contains high resolution graphic routines needing graphic pages at the beginning of RAM. This is done by changing the value of "BS" in step 10.

The remaining of the program simply deals with prompting for the filename to be used when saving the program to disk or cassette and it is self-explanatory.

Next, let's discuss how the *64KBASIC* loader program works.

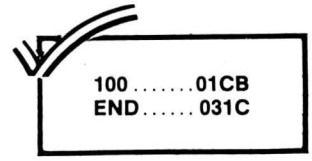
Steps 10 through 110 simply prompt for the filename and system in use, then do a crude attempt at some simple low resolution graphics while you wait for the system to do its work.

Steps 120 through 170 do the switching to 64K. These steps can be used as a stand-alone program to accomplish this task, or as a subroutine in any program needing the upper 64K or RAM. These steps *POKE* a machine language subroutine in an unused low RAM area (starting at &H200) located before the area used for the video output.

Steps 180 through 230 offset-load the BASIC program as if it were a machine language program.

Steps 240 through 260 set the BASIC pointers according to the system in use. Here again, the pointers are set to maximize RAM storage and should be changed if your program contains any graphics requiring the graphic pages. This is done by changing the "&H0E" in step 250 or the "&H06" in step 260 to allow room for the graphic pages. The Radio Shack manual has a memory map indicating the location of the graphic pages in the various graphic modes.

Writing these short utilities continue to be a source of enjoyment for me and I sure enjoyed chatting or corresponding with many Color Computer users who are trying to maximize their use of our fine little machine.



Listing 1:

```
1 ' ****************************
2 '          CONVERT.64K
3 '        BY: JORGE MIR
4 ' ****************************
10 IF PEEK(&HCØØØ)=68 THEN S=&H2
601:SS=&HB2:BS=&HØEØØ ELSE S=&H1
```


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```
E01:SS=&HA2:BS=&H0600
20 E=PEEK(25)*256+PEEK(26)-2:X=S
30 A1=PEEK(X):A2=PEEK(X+1):A=A1*
256+A2
40 POKEX,A1+SS
50 IF A=E THEN 70
60 X=A:GOTO30
70 POKE E,0:POKE E+1,0
80 POKE BS,0:POKEBS+1,0:POKEBS+2
,0
90 CLS:PRINT" GET READY TO SAVE
CONVERTED      PROGRAM.":PRINT:PR
INT" PRESS ANY KEY WHEN READY."
100 IF INKEY$=""THEN100
110 PRINT:PRINT" PLEASE ENTER PR
OGRAM NAME TO     BE USED FOR SAV
ING.   (NAME      CANNOT EXCEED 8
 CHARACTERS)."
120 INPUT PG$:IF LEN(PG$)>8 THEN
 120
130 IF S=&H2601 THEN PG$=PG$+".6
4K":SAVEM PG$,S-1,E+2,S-1:GOTO15
0
140 CSAVEM PG$,S-1,E+2,S-1
150 CLS:PRINT" CONVERTED PROGRAM
 HAS NOW BEEN  SAVED AND CAN BE
EXECUTED IN     THE 64K MODE USIN
G THE LOADER    PROGRAM '64KBASIC
'."
```

```
100 ..... 034B
END ..... 0565
```

Listing 2:

```
1 ' ****************************
2 '          64KBASIC
3 '       BY: JORGE MIR
4 ' ****************************
10 CLS:INPUT" PROGRAM NAME";PG$:
IF LEN(PG$)>8 THEN 10
20 PRINT:PRINT" INDICATE DEVICE
TO BE USED:      <C>ASSETTE OR <D
>DISK?"
30 I$=INKEY$:IF I$=""THEN30
40 IF I$<>"C" AND I$<>"D" THEN 3
0
50 CLS3:PRINTSTRING$(32,128);:PR
INT@32,STRING$(32,163);
60 TAB=INT((30-LEN(PG$))/2):PRIN
T @TAB,"*";PG$;"*";
70 PRINT@202,CHR$(177)+STRING$(8
,179)+CHR$(178);
80 PRINT@234,CHR$(181)+CHR$(191)
+"PLEASE"+CHR$(191)+CHR$(186);
90 PRINT@266,CHR$(181)+CHR$(191)
+" WAIT "+CHR$(191)+CHR$(186);
100 PRINT@298,CHR$(180)+STRING$(
8,188)+CHR$(184);
110 PRINT@448,STRING$(32,172);:P
RINT@480,STRING$(31,128);:PRINT@
484,"*** CHANGING TO 64K ***";:P
OKE&H5FF,128
120 Y=0
130 D$="1A508E8000A684B7FFDFA780
B7FFDE8CFF0026F1B7FFDF1CAF39"
140 FOR X=1TOLEN(D$)STEP2:SOUND
RND(200),1
150 A$="&H"+MID$(D$,X,2):A=VAL(A
$)
160 POKE&H200+Y,A:Y=Y+1:NEXTX
170 POKE&HFF40,0:EXEC&H200
180 SOUND 100,1
190 PRINT@480,STRING$(31,128);:P
RINT@484,"** LOADING PROGRAM **"
;:SOUND100,1
200 IF I$="C" THEN CLOADM PG$,&H
A200:GOTO 220
210 PG$=PG$+".64K":LOADM PG$,&HB
200
220 PRINT@480,STRING$(31,128);
230 FOR X=0TO2:POKEA+X,0:NEXTX
240 IF I$="C" THEN 260
250 POKE25,&HD8:POKE26,1:POKE27,
&H0E:POKE28,3:RUN
260 POKE25,&HC0:POKE26,1:POKE27,
&H06:POKE28,3:RUN
```


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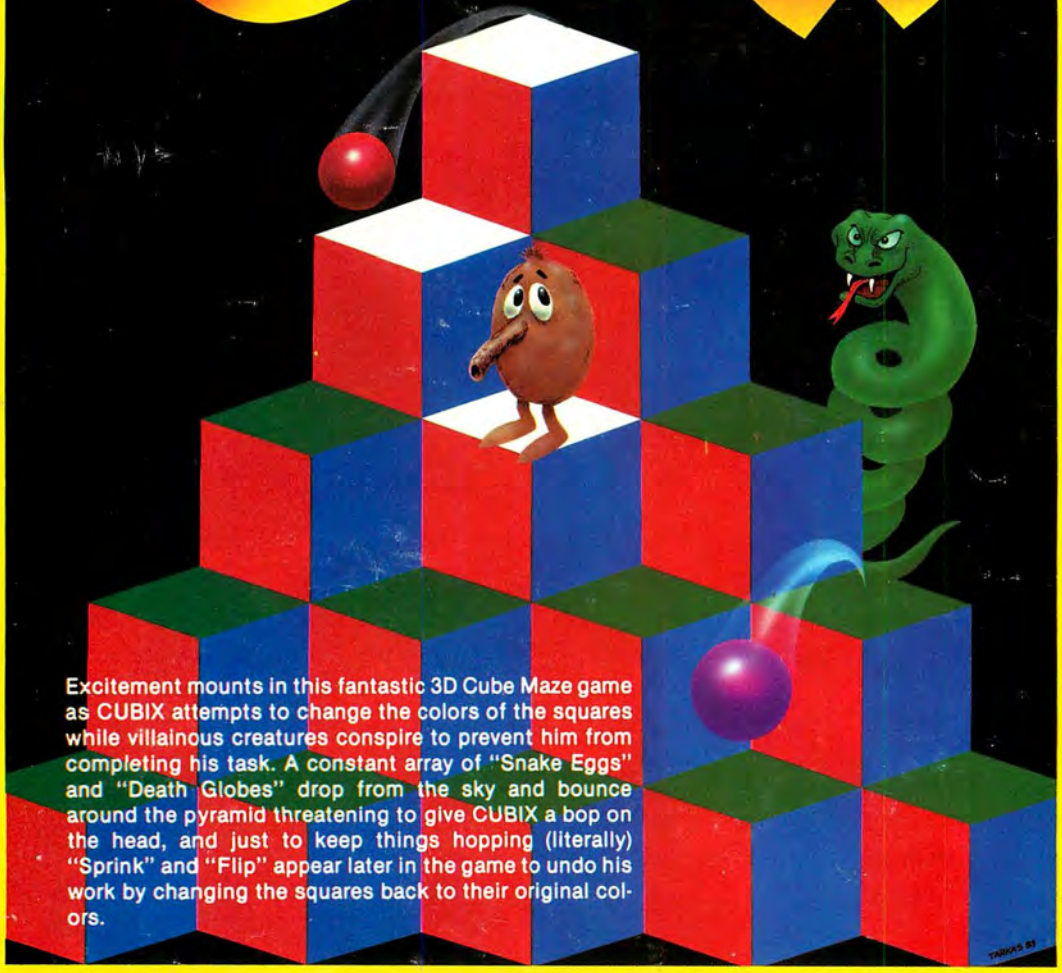
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